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AN EXPLORATORY STUDY OF THE RELATIONSHIP BETWEEN KNOWLEDGE AND SHORT-TERM COMPLIANCE IN NEWLY-DIAGNOSED PATIENTS WITH DIABETES MELLITUS

by

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DEDICATION

To my parents, in appreciation of their
love, support and constant encouragement.

ABSTRACT

The purpose of this exploratory study was to investigate the relationship between knowledge and short-term compliance in individuals newly-diagnosed with Diabetes Mellitus.

The sample consisted of ten diabetic individuals attending a diabetes education program either at a hospital or a metabolic centre. Six of the subjects were insulin-dependent, two were controlled with oral hypoglycemics and two were controlled by diet alone.

Four methods were utilized to obtain the data, including tests of knowledge, observation of subjects during the education program, skills performance checklists and interviews.

Subjects were given a pretest of knowledge prior to attending classes. They were observed during the classes for their reactions to the education experience. At the completion of the education program, each subject was given a posttest of knowledge, and observed performing selected skills incorporated as part of his or her prescribed therapeutic regimen. Skills performance were assessed utilizing skills checklists. The skills include: (1) the preparation and administration of insulin or oral hypoglycemic medications; (2) urine testing; and (3) diabetic footcare. At the follow-up visit (conducted between six and thirteen weeks after completion of the education program) each subject was given a follow-up test of knowledge equivalent to the posttest. Again, performance in carrying out selected skills was assessed. An interview was conducted to determine the extent of compliance with the therapeutic regimen and identify problems encountered in following the regimen.

The data were treated in two ways. The information was organized into individual case studies. It was then analyzed to determine significant findings for the subjects as a group.

The findings of the study indicated that, at the conclusion of the education program, subjects had an acceptable level of knowledge and skills. Variations were evidenced at the follow-up visits. Some subjects demonstrated increased levels of knowledge, some decreased and some remained the same. Increased confidence in carrying out selected skills was observed with some subjects while others showed decreased accuracy in their ability to carry out the selected skills. The extent of subjects' compliance with their prescribed therapeutic regimens varied among subjects. Medication administration was the area in which there was greatest compliance among subjects. Diet and exercise were the aspects of the therapeutic regimen with which there was the least amount of compliance. There was not a consistent relationship between knowledge and extent of compliance among the subjects.

From the findings of the study, it was concluded that, for these subjects, knowledge is not the most important determinant of compliance. Factors identified as important in compliance include belief in the value of a treatment, cost of the treatment to the subject and support of relatives or significant others.

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CHAPTER I

STATEMENT OF THE PROBLEM AND DEFINITION OF TERMS

I. INTRODUCTION

Patient compliance with medical advice has long been a concern of health care workers. Hippocrates articulated one aspect of this concern when he stated: "The physician should keep aware of the fact that patients often lie when they state they have taken certain medicines." (Haynes, Taylor & Sackett, 1979:3). Prior to the discovery of treatments with proven therapeutic outcomes, the refusal of a patient to adopt the recommendations of a health care practitioner might well have been justified in terms of survival. Many of the treatments were unproven and based on superstition and intuition. They frequently resulted in a worsening of a patient's condition or in his demise.

The widespread acceptance and application of scientific principles to medical research and practice has resulted in the development of large numbers of proven therapeutic treatments for a wide variety of acute and chronic disease conditions. In spite of the proven value of these medical treatments, compliance continues to be a problem. A recent survey of studies investigating patient compliance reveals that at least one-third of subjects in most studies fail to follow physicians advice. When the required health behavour is preventative in nature and/or when the person is asymptomatic and/or when the treatment regimen is long term only about one-half of patients are usually compliant (Cohen, 1979:5).

A belief common among members of the health care professions is that if a patient is taught about his disease, its causes, effects and what should be done, then he will follow through with the appropriate behaviour. Patient education has become an important function of health care workers.

Failure of patients, particularly those with chronic illnesses, to comply with prescribed therapeutic regimens has implications for patients, for health care workers and for society. Chronic illnesses present a major health problem. Failure to follow medical advice may result in a worsening of an individual's condition and the development of complications. The costs of recurrent hospitalizations and treatments for complications have contributed to the rapidly increasing costs of health care. The loss of economic productivity is great. A serious concern for society is created by the wasted potential of those people who, by refusing to comply with proven therapies, suffer long-lasting and detrimental changes.

> The awakening of the American public to the problem of chronic illness in the 50's proved to be a stimulus to health professionals to look to their responsibility relative to those patients for whom no cure for their disease was possible (Morris, 1979:9).

The increasing incidence of chronic diseases has necessitated changes in the relationships between those who provide health care and those who receive it. Whereas patients with acute illnesses may be willing to passively accept medical care because of the relatively short duration of treatment, patients with chronic illnesses must, of necessity, become active participants in their own care (Cohen, 1979:xiii). As well, consumer interest in health care is growing.

Patients today are better informed, more concerned about their rights and more questioning of medical authority and advice than ever before. The practice of patients blindly following the advice of physicians and other health care workers is disappearing. Patients feel they have a right to know information relevant to their conditions and a right to make informed decisions concerning their health (Narrow, 1979:13). The growth of consumer interest groups, health co-operatives, demands for second opinions and patient advocates are manifestations of the increased participation of patients in their care.

Much has been written about the need for patient education and the teaching role of health care personnel, particularly nurses (Morris, 1979; Narrow, 1979; Pohl, 1978; Redman, 1976). Patient teaching is a recognized part of the role of the nurse. Nursing education programs incorporate principles of patient teaching into their curricula. Unfortunately, follow-up assessment of the effectiveness of patient teaching in terms of compliance is not well documented. Studies that have been done show conflicting results as to whether or not patient education has much impact on compliance (Becker & Maiman, 1975; Haynes et. al., 1979). It is an area that requires further investigation. Findings will have implications for education programs and for health care workers.

Diabetes Mellitus is a chronic condition which characterizes many of the previously-mentioned concerns. It is estimated that diabetes affects five percent of the population. The incidence is increasing at a rate of approximately six percent per year (Morris, 1979:8). In 1974, Statistics Canada (47) reported this disease as eighth highest in frequency of demands on Canadian hospital services. There is no known cure for diabetes but treatments have been developed which, if followed, help to reduce complications and improve prognoses of patients (Brunner & Suddarth, 1980:834). Treatments include taking daily medications, following a special diet, carrying out prescribed exercises, testing urines and carrying out special care of the skin. Haynes et. al. (1979:3) have recognized that "therapeutic regimens frequently involve a variety of components, some of which necessitate a change in lifestyle whereas others involve learning new tasks such as the taking of medications." Most authors agree that the former is more difficult than the latter.

This exploratory study provides some current empirical data about the relationship between knowledge and short term compliance in newly-diagnosed diabetics, upon which general program planning and individual teaching can be based. It also provides information about diabetic patients' perceptions of the effectiveness of instruction and current methods of follow-up.

II. STATEMENT OF THE PROBLEM

Before effective strategies can be developed to improve compliance of patients with Diabetes Mellitus, there is a need to examine the influence of various factors on compliance. Specifically, there is a need to examine the relationship between the knowledge of newly-diagnosed patients about their disease and their compliance with prescribed therapeutic regimens in the home.

III. PURPOSE OF THE STUDY

The purpose of this study was to examine the relationship between knowledge and short-term compliance in patients newly-diagnosed as having Diabetes Mellitus. Answers were sought to the following specific questions:

1. What teaching do patients receive about Diabetes Mellitus during their initial education?
2. What knowledge and performance levels regarding the prescribed therapeutic regimens are demonstrated by patients immediately upon completion of the education program?
3. What knowledge and performance levels regarding the prescribed therapeutic regimen are demonstrated by patients six weeks after completion of the education program?
4. What problems do patients encounter in following their prescribed therapeutic regimens during the six weeks after completion of the education program?

IV. JUSTIFICATION OF THE STUDY

Diabetes Mellitus is a disease which presently affects one person in twenty and its incidence is increasing. The treatment regimen involves a number of components. Some, such as following a special diet, involve changes in lifestyle. Others, such as learning how to administer medications, test urines and do footcare, involve learning new behaviours. Sackett & Haynes (1976:31) state:

> ... the compliance exhibited by patients who must acquire new habits, such as taking medications, is much greater than that exhibited by those who must alter old behavours, such as dietary or vocational habits, which exceeds, in turn, that of those who must break personal habits, such as smoking or drinking or nonmedical use of drugs.

The individual with diabetes may be faced with all of these alterations in his life as part of his prescribed therapeutic regimen.

Commenting on a national survey of 300 health professionals Etzweiler (1973:2), a noted diabetologist and educator, states:

> Almost without exception, the professionals who responded related that the major problem in the current management of diabetes today is "lack of patient knowledge and understanding of the disease and its management". Other areas of chief concern were: "lack of ability to provide sufficient time, personnel and appropriate materials to teach the patient about his disease", and "lack of patient cooperation in the management of his disease".

As lack of knowledge and lack of patient co-operation have been identified as major concerns in diabetic management, it is important to gain information from patients about their reactions and reasons for following or not following medical advice. Only by consulting individual patients can their perspectives be gained and an appreciation of the problems they face be understood.

It is hoped that the information gained from this study will be of interest and value, not only to nurses but to other health professionals interested in the education of diabetics.

V. ASSUMPTIONS, LIMITATIONS AND DELIMITATIONS

Assumptions

1. It was assumed that the compliance of patients with Diabetes Mellitus with their prescribed theraputic regimens will result in beneficial health outcomes.
2. It was assumed that the instruments used to assess knowledge and performance levels of patients are representative of the essential knowledge and skills required by diabetics to comply with their prescribed therapeutic regimens.
3. It was assumed that the selected subjects were prepared to answer interview questions honestly and report accurately on their degree of compliance.

Limitations

1. The findings of this study are limited only to the population being investigated, newly-diagnosed diabetic adults attending a diabetic education program at one selected hospital and one metabolic centre.
2. The use of a structured interview to determine compliance with exercise and diet prescriptions was a major limitation because it relied on subjective recall of behaviour rather than activities that could be observed.

Delimitations

1. The study was delimited to ten selected subjects participating in a series of Diabetic Lectures either at one selected hospital or metabolic centre.

2. The subjects were restricted to those who were adults (over eighteen years of age), who were newly diagnosed as having Diabetes Mellitus or who had not previously attended a diabetic education program and who displayed fluency in the English language. The study was further delimited to subjects who lived within an area easily accessible to the investigator for the follow-up interview.
3. The subjects selected for participation in the study were delimited to those who would consent to participate in all phases of the study and whose physicians consented to their participation.

VI. DEFINITION OF TERMS

Important terms and their definitions as used in this study are listed below. Other terms which arise in the course of the study are defined as they are introduced.

Compliance: The extent to which a person's behaviour (in terms of taking medications, following diets and executing changes in lifestyle) coincides with medical or health advice (Haynes et. al., 1979:1-2).

Diabetes Mellitus: A chronic multi-system illness characterized by a disorder in carbohydrate metabolism with a subsequent derangement in fat and protein metabolism. The disease is associated with abnormalities in a variety of tissues and organs and with a number of acute and long-term complications (Brunner et. al., 1980:833).

Patient Education: The planned combination of learning activities designed to assist people who are having or have had experience with illness in making changes in behaviour conducive to health (Squyres, 1980:1).

Prescribed Therapeutic Regimen: The directions given to a patient by a physician or other health care professional regarding behaviours conducive to coping with his illness. With Diabetes Mellitus, the directions concern five major aspects of treatment. These include: (1) insulin or oral hypoglycemic medications, (2) diet, (3) exercise, (4) diabetic urines, and (5) diabetic foot care.

VII. DESIGN OF THE STUDY

A brief description of the design of the study including the sample, data collection procedures and data analysis is presented in this section. Each topic is presented in detail in Chapter III.

Sample

Subjects for the study were selected from the population of diabetics attending education programs at one selected hospital and one selected metabolic centre. Four subjects attended the hospital education program and six subjects attended the program presented at the metabolic centre. All ten subjects expressed their willingness to participate in all aspects of the study.

Methodology

The selected subjects were given a colour-coded pretest to assess their levels of knowledge about Diabetes Mellitus prior to attending the diabetes education program. At the conclusion of the program the subjects were given a colour-coded posttest to assess their level of knowledge. They were also asked to carry out three procedures incorporated in the treatment regimen including: (1) the administration of insulin or oral hypoglycemic medications, (2) the testing of urines according to the method learned, and (3) diabetic footcare. Their performance of these skills were assessed by means of skills checklists. Knowledge about diet and exercise were included as part of the posttest.

The subjects were visted in their homes by the investigator between six and thirteen weeks after the subjects had completed the education program. Subjects were asked to complete a test of knowledge (follow-up posttest) equivalent to the posttest completed at the conclusion of the education program and were asked to perform the three aspects of the therapeutic regimen previously observed. Their performances were again assessed utilizing skills checklists. A structured interview was conducted which incorporated questions concerning compliance with prescribed diet and exercise programs. Questions were also asked concerning difficulties the subject encountered in following their prescribed therapeutic regimens. Each subject was also asked to relate suggestions regarding information he or she felt would have helped in coping with the therapeutic regimen at home.

Analysis of the Data

Pretest, posttest and follow-up posttest scores for each patient were examined and compared to identify areas of deficient knowledge and to determine if common patterns of response existed among the subjects.

The performances of the selected psychomotor skills of each subject were examined to determine if changes had occurred between the first and second observation. Each checklist was examined for areas of difficulty and the performances of all ten subjects were analyzed to identify whether or not common areas of difficulty exist.

The responses of the subjects to the questions included in the interview were analyzed and suggestions made by the subjects were summarized and classified.

The information obtained from the data collection process was presented in an individual case study format. The data were then analyzed to obtain the characteristics of the adults as a group.

VIII. ORGANIZATION OF THE THESIS

In Chapter I, an introduction to the problem, the problem statement and the purpose of the study were presented. Justification for the study, definition of terms, assumptions, limitations and delimitations were also discussed.

Chapter II presents a review of the literature with emphasis on theory and research studies relating to compliance, patient education and studies specifically concerning individuals with diabetes.

The research methodology is discussed in Chapter III. It includes the construction of the research instruments, sources of data, data collection procedures and analysis of the data.

Chapter IV presents the data in the form of individual case studies.

The findings of the study, as they relate to the adults as a group are reported in Chapter V.

The final chapter contains a summary of the findings as well as the conclusions, implications and suggestions for further research.

CHAPTER II

REVIEW OF THE RELATED LITERATURE AND RESEARCH

The review of the related literature and research is presented in this chapter in four sections. A discussion of compliance is presented first. This is followed by an examination of the literature related to patient education. The next section examines the literature which specifically relates to diabetes. The last section contains the conceptual framework for the study.

I. COMPLIANCE

A review of the literature written about compliance reveals that there is little consensus about its various facets. Areas of concern include the definition and use of the word itself, methods of assessing compliance, factors which influence compliance, the relationship between knowledge and compliance and appropriate strategies which can be implemented to improve compliance.

Definition

Davis (1968:115) differentiates between attitudinal and behavioural compliance:

> As an attitude, compliance consists of an orientation or willing readiness to do what the doctor prescribes or an intention to stop doing what the doctor proscribes. In its behavioural aspect however, compliance can be said to exist only when the patient carries out the doctor's order.

According to Davis, the distinction between attitude and behaviour is important because patients may display incongruence between their intention of complying and their actual behaviour. The example he uses to illustrate the distinction is that of a patient who intends to take his prescribed medication but does not because of forgetfulness, cost or inability to follow directions. The patient's failure, regardless of reason, results in non-compliance (Davis, 1968:116).

An operational definition of compliance has been developed which has gained wide acceptance. Haynes et. al. (1979:1-2) define compliance as "the extent to which a person's behaviour (in terms of taking medications, following diets and executing changes in lifestyle) coincides with medical and health advice". Compliance is defined only in terms of behaviour, which can be measured. The question of intent is not addressed.

The term compliance has generated some concern and in the literature the term adherence is frequently used in its place. Haynes et. al. (1979) discuss the negative connotations associated with the term compliance, particularly the idea of implied subservience of patients to the authority of physicians or other health care workers. In their view, this concept is not inherent in the definition. Compliance is, and should be, non-judgemental in nature.

Methods Used to Measure Compliance

Compliance research presents many difficulties. A major difficulty is that medical advice is given to patients in a wide range of circumstances and by a number of different health professionals.

> Patient noncompliance may be manifested in a variety of behaviour patterns including delay in seeking care, nonparticipation in community health programs such as immunization or screening, failure to keep follow-up appointments and failure to follow physicians' instructions. These physicians' instructions may be of two types: they may be additive, e.g., instructing the patient to take a medication, or to exercise, or restrictive, e.g., to avoid certain foods or to avoid certain activities. In each form of noncompliance the questions of measurement are somewhat different (Gordis, 1976:51).

Gordis (1976) classifies measures to improve compliance into two groups: direct measures and indirect measures. Direct measures include procedures such as assessment of blood levels of drugs and urinary excretion of medications or metabolites. Indirect measures include such methods as assessment of therapeutic outcomes, impression of the physician, patient self-report (interview), filling of prescriptions and pill counts.

There appears to be no infallible methods to measure compliance. Each method presents the researcher with factors which must be considered. Issues to be considered when using direct methods include: the difficulty in obtaining required specimens, the sequencing and timing of tests, the potential effect of the measurement on patient behaviour and the interpretation of results (that is, are patients being characterized on the basis of a single test or on the basis of periodic testing) (Gordis, 1976:54-57).

Indirect measures of compliance must also be carefully considered. A problem with using therapeutic outcome as an indicator of compliance is that the outcome can be affected by many external factors. Pill counts as measures of compliance may present problems in terms of overestimation. Pills may be discarded rather than consumed or may be used by other members of the family (Gordis, 1976:63). The impression of the physician may not be easily quantified. As well, Gillum & Barsky (1974:1563) state:

> Studies have shown that physicians, generally, grossly underestimate the rates of noncompliance in their practice and are inaccurate in identifying noncompliant individuals.

Research has been done on the validity of interview data as a measure of compliance. Eight studies in which compliance was estimated both by interview and an alternate method such as pill counts or urine tests is commented upon by Gordis (1976:63):

> In all these studies, there is little or no evidence to suggest that complying patients misrepresent themselves as noncompliers, nor is there evidence that those who profess noncompliance at interviews are lying. Thus, although there are serious questions regarding the validity of interview responses, if the only objective of the interviewer is to identify noncompliers many may be identified by this indirect method. The degree to which this kind of information will be adequate depends on the consequences to the noncompliers who are missed at interviews because they profess to be compliant.

Factors Influencing Compliance

In a review of the literature up to 1970, Marston (1970:312-321) is unable to identify a clear picture regarding the determinants of compliance. Whereas some studies show significant positive results with one variable, other studies testing the same variable demonstrate no significant findings. In Marston's review, knowledge of the illness and its treatment is identified as one variable which does not necessarily lead to compliance. Problems associated with drawing conclusions from an extensive review of studies are many. They include variations in the operational definition of compliance, lack of objective measures of compliance with certain medical recommendations and the loss of precision in estimating compliance based on different medical recommendations. She concludes that "compliance with medical advice was likely determined by some type of interaction effect involving demographic, illness and psychosocial variables" (Marston, 1970:321). She notes that almost all of the research has been conducted by physicians and behavioural scientists and suggests that the problems of motivating and encouraging people with diseases to comply with medical advice is an appropriate concern for nursing.

In more recent, comprehensive reviews of studies related to compliance done in 1975 and 1979, Haynes et. al. (1979) identify the same problems as Marston (1970) expressed. Factors studied include: demographic features of patients, features of the disease, of the therapeutic regimen, of the therapeutic source, of patient therapist interactions and sociobehavioural features of patients. The results of their analysis of studies related to compliance is that there is no single or simple explanation for failure of patients to comply with medical advice. They have isolated some factors which have importance in influencing compliance, including:

1. Compliance is much greater in patients who must acquire new habits than those who must alter old behaviours.
2. There is a decrease in compliance as the complexity of the regimen increases.
3. Inadequate supervision and patient dissatisfaction with health care providers decreases compliant behaviours.
4. Patients with inappropriate health beliefs, a previous history of noncompliant behaviour and/or family instability are more likely to refuse to comply with medical advice (Haynes et. al., 1979:39).

Other compliance investigators agree with these findings (Cohen, 1979; Lasagne, 1976). The authors recommend inter-disciplinary cooperation and communication in conducting compliance research.

Theories have been formulated to explain compliant behaviour in patients. None have shown consistent positive results in research studies. One promising theory which has evolved adopts a psychosocial approach to explain health behaviours. It is called the "Health Belief Model".

> The Health Belief Model postulates that the likelihood of understanding a health action is a function of an individual's beliefs along four subjective dimensions: (1) perceived level of susceptibility to a particular condition; (2) perceived degree of severity of the consequences which might result from contracting the condition; (3) estimation of the recommended health actions potential benefits or efficacy in preventing or reducing susceptibility and/or severity; and (4) views of possible psychological and other costs or barriers related to the proposed action. In addition, the Model stipulates that a stimulus or "cue to action" is necessary to trigger the appropriate health behaviour by making the individual consciously aware of his feelings about the condition (Mainman, Becker, Kerscht, Haefner & Drachman, 1977:216).

This model, the subject of much investigation, shows significant positive results in patient studies of several conditions including diabetes (Infante, 1977), obesity (Mainman et. al., 1977) and hypertension (Sackett and Haynes, 1976).

Stimson (1975), a medical sociologist, adopts a different perspective about compliance. He notes that a large number of compliance studies deal with drugs. In a review of nineteen studies, Stimson (1975:29) found that three kinds of questions were asked:

1. How many people do not use their medicines as the doctor instructs?
2. What characteristics do they display?
3. Why do they not follow instructions?

In his opinion, the last question has received the least amount of attention and possible reasons are presented as incidental to the investigation. He expresses several concerns about these studies. They have adopted the physicians', rather than the patients', point-of-view. The patients are not regarded as responsible individuals who are able to report honestly, so other methods must be used to determine the degree of compliance. An assumption inherent in these studies is that the blame for failure to comply lies with the patient. He suggests that studies be designed from the patient's perspective rather than the physician's. It is necessary to look at the broader social setting and the meaning attached to the behaviour by the patient. He believes that from this perspective there may be many reasons for failure to carry out the advice of a physician.

> The patient is continually open to new information about his illness and medicines from friends and others. He will be continually reassessing the consultation, the doctor's actions, and the prescribed medicine. The patient is repeatedly faced with the problem of whether he is doing the right thing with regard to his health (Stimson, 1975:31).

In investigating why a patient does not follow medical advice, Stimson believes that it is necessary to "take account of the patient as a decision-making individual living in a culture from which he is receiving information about health and illness" (1975:31).

Knowledge and Compliance

The relationship between knowledge and compliance is not well-defined. It is the subject of much controversy. In her review of the literature, Marston (1970) is unable to identify a relationship between knowledge and compliance. In their analyses of 185 original articles about compliance Sackett & Haynes (1976:36) are also unable to identify a relationship between knowledge and compliance:

> An interesting finding at sharp variance with conventional wisdom is that there appears to be no relationship between patients' knowledge of their disease and its therapy and their compliance with the associated treatment regimen. Although some studies have concluded that patient knowledge does lead to better compliance, a statistical comparison of methodologic scores (one-tailed students t-test) reveals that studies concluding no relationship are of greater methodologic soundness. Accordingly, it appears that the gap between the clinical prescription and the patient's subsequent compliance is at best marginally narrowed by knowledge possessed or, indeed, imparted by the patient. That this is so is further supported by a lack of association between patient's intelligence or educational achievement and compliance.

D'Onofrio (1980:274) questions the conclusions of Sackett & Haynes (1976). In particular, she questions their interpretation of what is meant by knowledge.

> Educational specialists emphasize the importance of active patient participation in problem identification and prioritizations, in the establishment of change objectives, and in the process of making decisions about how change will be accomplished. This implies, then, that patients should help to define the knowledge that they need in order to cope with their illness and treatment regimen. Neverthless, all too frequently the information made available to patients - and research methods of knowledge levels - are based solely on what providers decide patients ought to know (D'Onofrio, 1980:274).

She also expresses concern that the research methodologies employed in the studies do not adequately measure the relationship between knowledge and compliance behaviours. "Theory indicates that the real influence of knowledge on compliance is much more likely to rest on the interaction with other variables affecting learning and change" (D'Onofrio, 1980:274).

Hogue, in examining the nursing literature relating to compliance, concludes that the transmitting of information is not enough to ensure compliance. In her view, it is essential to determine the ways in which the patient defines his situation. She believes it is necessary to place less reliance on the transmittal of information as a means of improving compliance. Her recommendations include approaching the regimen from the patient's point-of-view in making the regimen understandable, promoting the patient's participation in his own care, helping the patient to feel competent to manage the regimen and utilizing the patient's natural support systems to assist in improving compliance (Haynes et. al., 1979:253-257).

The conclusion that can be drawn from the literature is that transmittal of information to patients, by itself, is not sufficient to ensure compliance. However, this does not mean that knowledge is not important. It is an inescapable fact that if a person does not know what to do or how to do it, he will not be able to comply with a regimen. It appears therefore, that knowledge is only one of the components in compliance of an individual with his therapeutic regimen.

Strategies to Improve Compliance

Strategies for improving compliance can be grouped into three major categories which are education, behavioural and combined approaches. Educational strategies are defined by Sackett & Haynes (1975:74) as "those which attempt to improve compliance through the transmission of information about a disease and its treatment to patients". Educational strategies which have been the subject of research include fixed-content health measures, individual counselling, counselling supplemented with written instructions, programmed instruction, lecture-demonstration series and emotional role-playing.

Behavioural strategies are directed towards changing the compliance behaviours of patients. They include attempts to reduce barriers to compliance such as expense or inconvenience; to cue or stimulate compliance and to reward or reinforce compliance (Sackett & Haynes, 1976:70). Examples of behavioural strategies which have been researched include simplification of medication schedules, behaviour modification, telephone reminders for appointments, serum drug monitoring plus increased supervision, home visits, free medication and convenient clinics with home visits. Combined strategies include both educational and behavioural approaches.

Sackett & Haynes (1976:75) classified the compliance studies included in their review of the literature and analyzed the success rates of the three types of strategies in terms of increasing compliance. The success rate for educational strategies was 64 percent, for behavioural strategies 85 percent and for combined strategies 88 percent. They also assessed the success rates in terms of therapeutic outcome. Using this criteria, the findings were 50 percent for educational strategies, 82 percent for behavioural strategies and 75 percent for combined strategies. They conclude "that behavioural and combined strategies may hold a substantial edge over educational strategies in terms of improving both compliance and therapeutic outcomes (Sackett & Haynes, 1976:74).

Green, a health educator, takes issue with the above interpretations of the effects of educational strategies on compliance.

He expresses concern about the application of narrow concepts in the definitions of health education in research. He also comments on the tendency to export educational methods from one situation to another without adequate assessment of educational needs and the primitive measurement tools utilized in research (Haynes et. al., 1979:159).

II. PATIENT EDUCATION

Definition and Goals

Patient education is defined as "planned combinations of learning activities designed to assist people who are having or have had experience with illness or disease in making changes in their lifestyle conducive to health" (Squyres, 1980:1). Patient education is not restricted to any one setting. It can occur in a hospital, a doctor's office or in the individual's home. Patient education is the responsibility of many types of health care workers. Nurses have long been involved in the education of patients. Redman (1976:1) recounts that nursing leaders in England in the middle of the nineteenth century recognized the importance of teaching families about hygiene and care of the sick. Narrow (1977) believes that the nurse is the most significant health teacher because of her knowledge, her opportunities for teaching while providing care, her ability to individualize teaching for a given patient and because of the nature of the nurse-patient relationship. As well, nurses are easily accessible to patients. They too are found in the hospitals, in the doctors' offices and in the community. "Teaching is not an optional activity, it is an essential nursing intervention" (Narrow, 1979:2).

The ultimate goal of health education is optimal health for the individual. Specific goals must be developed for particular educational programs. The goals for the education of a patient with an acute, short-term illness are different in nature and scope from the goals for the education of an individual with a chronic illness.

Etzweiler (1973:1) identifies that the treatment of chronic diseases, such as diabetes, requires active participation by the patient in his own care, with the physician and other health care workers assuming a supportive role. He states:

> It must be realized that the most important person in the control of disease and the maintenance of health is the patient himself. Effective care for the future means the education and support of these patients, for today's health care needs can only be met by an informed patient cooperating with knowledgeable and interested health professionals. The patient must become a recognized member of the health care team (Etzweiler, 1973:2).

Principles of Teaching and Learning

Successful patient education must address the individual's cognitive, psychomotor and affective domains. The individual must learn what he has to do, must acquire the skills to carry out his regimen and must accept the fact that he has an illness. He must also accept the responsibility for his care. Redman (1976:24) discusses teaching strategies appropriate to the three domains:

> Each of these domains responds best to particular methods of teaching. Facts and concepts are basic to intellectual learning and are taught by written materials, audiovisual aids representing the concepts, lectures and discussion. Learning of attitudes does not automatically follow from a knowledge of facts... Attitudes can perhaps best be taught by discussing with patients, providing insights into their feelings and gaining acceptance of a new attitude by providing a model to imitate, and by helping them to take action. Motor skills are best learned through a demonstration of skills with subsequent practice until they are perfected.

Patient education is composed of a teaching-learning process and will not exist unless both teaching and learning occur (Harper, 1978:1). Principles of teaching and learning have been developed to help facilitate effective patient education. These principles are based on research done in many fields including education and the social sciences. Pohl (1978:35, 53-54) summarizes these principles:

Principles of Teaching

1. Good nurse-learner rapport is important in teaching.
2. Teaching requires effective communication.
3. Knowledge of the cultural patterns of ethnic groups to be taught is essential.
4. The teaching-learning process requires nurse-client co-operation.
5. Learning needs of clients and co-workers must be considered.
6. Objectives serve as guides in planning and evaluating teaching-learning experiences.
7. Planning time for teaching and learning require special attention.
8. Control of the environment is an aspect of teaching.
9. Learning principles must be applied appropriately.
10. Evaluation is an integral part of teaching.

Principles of Learning

1. Perception is necessary for learning.
2. Conditioning is a process of learning.
3. Learning may occur through imitation.
4. The process of trial-and-error is a way of learning.
5. Problem-solving is a method of learning.
6. The development of concepts is part of the learning process.
7. An individual must be motivated in order to learn.
8. Physical and mental readiness are necessary for learning.
9. Effective learning requires active participation.
10. New learning must be based on previous knowledge and experience.
11. The emotional climate affects learning.
12. Repetition strengthens learning.
13. Reinforcement influences learning.

Mastery Learning

One of the goals of patient education, particularly for patients with chronic diseases such as diabetes, is that they should be competent to carry out the aspects of their prescribed therapeutic regimens. "Doctors, nurses and dietitians would agree that the diabetic patient should understand the nature of his disease and should possess the skills to be relatively self-managing" (Etzweiler, 1973:13). Patients must be able to master the knowledge skills and attitudes necessary to assume responsibility for their own care.

The mastery model of education is a system designed to structure an educational program so that a student will achieve the performance levels needed in order to be competent (Torshen, 1977:37). The mastery learning model has been developed and applied in the public school education system. However, its components are applicable to patient education programs.

According to Torshen (1977:41-47), the mastery learning model contains six components:

1. Objectives. The objectives are specific statements of goals which the student is expected to reach. In each area defined in the objectives, minimum pass levels are established which the student is expected to achieve.
2. Preassessment. This component involves identifying the student's starting point and determining the appropriate methods of instruction.
3. Instruction. Appropriate instructional methods to allow the student to master the objectives are implemented. There is no restriction on the type of instructional method.
4. Diagnostic Assessment. This assessment measures what the student has learned and what he has failed to learn. It is carried out at frequent intervals during the instructional program. The information is

used to pace the student's learning and to improve upon areas of instruction that have not been effective.

5. Prescription. This component consists of instructional activities recommended on the basis of the diagnostic assessment.

6. Post Assessment. The final phase of the model measures whether the student has met the objectives of the program. If the student fails to meet an objective, he is either recycled through the program or given additional instruction.

Ryan and Schmidt (1979:39-58) examine some of the research which has been conducted on mastery learning and find it an effective model in the learning of knowledge, skills and attitudes. "Mastery learning is most appropriate for those aspects of the curriculum that involve the basic skills, concepts, facts and attitudes that the student cannot afford not to learn" (Torshen, 1977:44).

III. DIABETES

Research Studies

Although many research studies have been carried out with diabetic patients, only a few are specifically related to compliance. In 1967, a research study was conducted on sixty adults with diabetes to determine the relationships among three variables: (1) knowledge, (2) management, and (3) control of the disease. The patients, all of whom had been diabetic for over one year, were visited in their homes and were observed for how they carried out their regimens related to insulin administration, insulin dosage, urine testing, diet, foot care and overall disease control. Methods used to assess performance included structured interviews and demonstrations. Results of the study showed that 48 patients administered insulin incorrectly and 31 patients made dosage errors. Twenty-seven patients tested urines in an unacceptable manner. Unacceptable diet practices were found with 44 subjects and 31 performed foot care incorrectly. No relationship was found between management and control. The researchers found that those patients in better condition knew more about their disease. Suggested areas for further research include methods to eliminate misunderstandings about directions, further assessments of patient knowledge levels, and investigations into patient motivations and the need for follow-up (Watkins, Williams, Martin, Hogan and Anderson, 1967a:452-459).

Watkins et. al. (1967b:882-885) examined two groups of diabetics for accuracy in carrying out prescribed medication regimens at home. The first group consisted of 60 insulin-dependent diabetics being cared for at two university clinics and the second group consisted of 102 patients being cared for at two university clinics, a hospital clinic and 22 private practices. In the second group, 55 patients were insulin dependent and 47 were taking oral hypoglycemic medications. Interviews were conducted by three public health nurses and a medical student. Each subject was asked to state the medication and dosage last prescribed by the physician and state the dosage he was taking at the time of interview. Depending upon whether the subject was on insulin or oral hypoglycemics, each was asked to show the interviewer the insulin and syringe and draw up the dosage he was taking or show the interviewer the number of tablets being taken and state how often he missed a dose. Fifty-eight percent of the insulin-dependent diabetics made dosage errors. Of these, 35 percent were found to be making potentially dangerous errors which were defined as errors of 15 percent or more of the prescribed dose. Among the patients taking oral drugs, 23 percent made potentially serious errors and 26 percent reported missing one dose or more per month. The errors made involved communication errors, measurement errors, or both. Variables were examined to determine if there was any relationship to errors in insulin dosage. It was found that those who had diabetes of 15 years or more duration made more errors. The authors made four recommendations including: 1) improved communication techniques; 2) simplified medications and equipment; 3) further study as to reasons for ommissions of oral medications; and 4) continuing education. When this study was conducted insulin and syringes were available in both 40 and 80 unit/ml. strengths. Since that time, insulin and insulin syringes have been standardized to 100 units/ml. Presumably this will have the effect of decreasing the incidence of errors with insulin therapy but this is an area that requires further investigation.

Diet therapy is an essential part of the therapeutic regimen in the treatment and control of diabetes. Reports concerning the success of patients in following their diets indicate that diet therapy is an area of difficulty. West (1973:426) reports the results of a 1968 United States National Health Survey: 22 percent of diabetics reported they had not received a diet to follow, 25 percent had received a diet but didn't follow it, and 53 percent stated that they followed their diet. He also reports one British study in which only 19 of 63 diabetics consumed within 10 percent of their prescribed diet during a one-week study of their food intake.

There are a large number of deterrents to successful diet therapy. Many are concerned with the abilities, desires and motivations of the patient. West (1973:173) comments on deterrents associated with patient education:

> The patient education system may be defective because of (1) limitations of acumen, enthusiasm and time of health professionals; (2) limited teaching manpower; (3) lack of economic incentives for health professionals and institutions to teach patients; (4) patient education efforts that are seldom sufficiently systematic (for example, responsibilities of physician, dietition and nurse may not be clearly or systematically delineated); or (5) underestimated general and specific deficiencies in patient education.

There is confusion among health professionals about dietary goals, strategies and priorities including uncertainty about the degree of dietary restriction necessary to maintain good diabetic control and prevent complications.

In a review of the literature relating to diabetic knowledge, self-care and metabolic control, Watts (1979:173) concluded that treatment compliance in diabetics is very poor. In his opinion, no single kind of intervention is likely to improve self-care in all diabetics. Appropriate interventions for an individual patient can be implemented only after the reason for the patient's failure to care for himself has been identified. He suggest checking on the following four factors before deciding upon strategies to help the individual:

1. whether the patient knows how to manage the diabetes.
2. whether the patient regards the diabetes as worth controlling.

3. whether he has an accurate impression of how well he is carrying out the treatment program as many patients feel they are caring for themselves better than they really are.
4. whether the patient feels that he has adequate supervision.

In a study completed in 1977, Infante utilized the Health Belief Model to assess the impact of psychosocial factors on levels of compliance in individuals with diabetes. Face-to-face interviews were conducted with 145 adult diabetics in their homes. Physicians of the patients assessed clinical outcomes as a measure of compliance. Analysis of the data revealed that some psychosocial factors had a significant influence on compliance of patients with their therapeutic regimens. These factors include perceptions of self, cost of care, boredom with the therapeutic regimen, anxiety, financial problems and relationships with significant others. Suggestions for future research include comparing what patients actually know about their regimens to what they think they know, and the development of appropriate testing instruments to accurately determine knowledge and skill levels (Infante, 1977:12-13).

Effective communication is essential for successful patient education. A study was done which examined the effectiveness of communication between physicians and their staff and diabetic patients (Hulka, Kupper, Cassel & Mayo, 1975:15-20). The sample was composed of 242 adults between the ages of 30 and 65 who had been diabetic for no longer than ten years, and 42 physicians. Each physician completed a form checking what instructions had been given to each patient. Each patient was then interviewed in his home by a nurse-interviewer about two weeks after the office visit. During the interview, each patient was asked whether or not he had received instructions in the areas which had been outlined by the physician. Only two-thirds of the information that the physicians had communicated was recalled by patients. Recall of communication was found to be best among insulin-dependent diabetics and those who had been diabetics for a longer period. The authors suggest that physicians may try harder to inform insulin-dependent diabetics about their care, or that insulin-dependent diabetics may be more receptive to learning due to the daily reminder of the insulin injection. Another suggestion is that insulin-dependent diabetics learn about the disease from the disease and its effects (Hulka et. al., 1975:26).

Diabetes Education

Many varied approaches have been developed to provide education for diabetics. "The technique of providing education for patients has varied from piecemeal instructions by physicians, nurses and dietitians in physician's offices, hospitals and clinics, to comprehensive patient-education programs" (Grabner, Cristman, Alonga & Davidson, 1977:61). The literature contains many descriptive accounts of education programs (Cammorata, 1976; Garber, 1977; Myers, 1977). In spite of the multiplicity of educational techniques and systems, there is no one perfect educational program. Each may have advantages and disadvantages (Krosnick, 1975:16).

Krosnick (1976) suggests some guidelines for diabetes education programs. General program goals and specific goals related to the individual and his family must be established. He advocates the use of the team approach to diabetes education which "has been indelibly established as the most desireable one" (Krosnick, 1977:16). Instructional content, as well as teaching methods and materials, must be flexible to allow for adjustment to the individual patient. Methods for evaluation of the program are essential.

One concern expressed about current programs is that too much time is spent on the delivery of information and not enough is spent on the assessment of patients' learning needs or the evaluation of the effectiveness of the educational program. del Bueno (1975:21) urges diabetes educators to "stop teaching patients and help them to learn! The goal of patient education is a positive change in behaviour, not simply acquisition of knowledge." Several articles written about diabetes education programs express the need for more effective evaluation (Grabner et. al., 1977; Krosnick, 1977; Morris, 1979).

In an evaluation of the state of diabetes education Redman (1977:6-9) identifies major successes in diabetic education including increases in patient education programs, the wider variety of teaching methods and materials and the use of innovative delivery systems to improve access to patients. She also examines the negative side of patient education:

> There has been abroad the notion that patient education either has positive effects or no effects at all. This simply isn't true. Negative effects are clearly occurring although we do not know how frequently. They can be very serious, such as the patient being given wrong information and acting upon it. Other negative side effects are serious but less obvious, such as the patient losing all confidence in his ability to manage his diabetes as a result of receiving education that was too difficult for him (Redman, 1977:7).

She suggests that there is a need to set up monitoring systems that measure concurrent and long range outcomes including both intended and unintended effects.

A principle of learning is that the individual must be ready to learn. In examining patient education, it is important to consider the emotional response of the individual to being diabetic. The diagnosis of diabetes can be very traumatic. Kivelowitz (1977:14-18) suggests that the individual, when initially faced with the crisis of diagnosis of a chronic disease, must cope with the loss of a consistent future orientation and face the anxiety of an unknown future. "Before the crisis the patient takes his lifestyle for granted; during it, he wonders what he can take for granted ..." (Kivelowitz, 1977:15). During the time of diagnosis and immediately following, it is unlikely that the patient will grasp the entire situation and its impact on his life. The immediate priority is not education but the reduction of anxiety. The patient requires reassurance that he will be shown what to do.

According to Blevins (1979:44-47) the individual may pass through several stages before he adjusts to his disease. Shock and disbelief is a frequent initial reaction to the diagnosis of diabetes. Depending upon the individual, the initial stage may be followed by denial, anger, depression and/or dependency before the stage of adjustment is reached. The receptiveness of the newly-diagnosed patient and his ability to learn and retain knowledge may vary depending upon his emotional state.

IV. CONCEPTUAL FRAMEWORK

Given the inconclusive nature of the information concerning the relationship between knowledge and compliance, the decision was made to adopt a multiple-method approach in this study. Direct assessment of knowledge and skills was accomplished by the use of multiple choice tests and skills checklists adapted from the literature. In accordance with the views expressed by Stimson (1974) that patients are responsible individuals capable of making decisions regarding their care, compliance of subjects with their therapeutic regimens was assessed by means of interviews. Questions included in the interview guide were based on concepts incorporated in the Health Belief Model (Maiman et. al., 1975).

SUMMARY

This chapter contained a review of the pertinent literature concerning compliance, patient education and diabetes. The literature indicates that knowledge does not appear to be as important a factor in compliance of diabetics with their therapeutic regimen as previously thought. It is evident that the relationship between knowledge and compliance requires further investigation.

CHAPTER III

METHODOLOGY

The research methodology is discussed in this chapter. The construction of the research instruments is presented first. The second section outlines the sources of data collection. Next, methods used to collect the data are described. The final section presents procedures used for analysis of the data.

I. CONSTRUCTION OF RESEARCH INSTRUMENTS

Compliance of an individual with a therapeutic regimen for Diabetes Mellitus involves changes in knowledge, skills and attitudes. In order to assess compliance of subjects in the sample group, it was necessary to utilize research instruments which would measure these aspects. Three sets of instruments were developed: (1) questionnaires to measure knowledge levels, (2) performance checklists to assess skills, and (3) interview questions to assess both attitudes and the extent of compliance with the prescribed regimen.

Knowledge Questionnaires

Two questionnaires were developed to establish knowledge levels of subjects at three points in time. A pretest was designed to be administered prior to the commencement of the education program. A posttest was developed to be given both at the conclusion of the education program and at the follow-up visit.

Test items included in the knowledge questionnaire were based on facets of the illness and aspects of the therapeutic regimen. For example, urine testing is a part of the regimen. Therefore, questions were included to determine knowledge about the frequency of testing and the interpretation of results.

The majority of test items were adapted from two previously-used instruments. The first is a questionnaire constructed by Watkins, Williams, Martin, Hogan and Andersen (1967a:452-259) of the University of North Carolina School of Medicine and Public Health. It was used in a comprehensive study of diabetes knowledge, control and compliance in 1967 and has been used in subsequent research (Moncure:1974). The second instrument is an evaluation tool used by the Diabetes Teaching Service, Michael Reese Hospital and Medical Centre in Chicago, Illinois, in the education program to assess patients' knowledge levels (Suren, 1977:433-434).

Questions were selected and adapted from these instruments based on objectives for diabetes education programs (Etzwiler, 1973:64-75). Other questions were generated by the investigator based on these same objectives.

Although the same knowledge questionnaire could have been used for the pretest, posttest and follow-up test, a separate pretest was developed. A potential problem with the use of measuring instruments is reactivity. Smith (1975:70-71) states that "methods of measurement sometimes modify or otherwise affect the subject's behaviour or attitudes during the measurement process." Fear and denial are frequent initial reactions to the diagnosis of Diabetes Mellitus (Blevins, 1979:40). An important consideration in conducting research is that the investigation should not harm the respondents who have agreed to participate (Babbie, 1973:349). It was the opinion of the investigator that the pretest should be as non-threatening as possible and that questions which might increase apprehension be avoided until the subjects had undergone the education program. It was for this reason that two tests of knowledge were developed and utilized in the study.

The Pretest. Part A of the pretest asked two general questions designed to gain information about what diabetes means and what information about the illness subjects have prior to the education program. Part B consists of twenty true-false questions concerning causes of diabetes and aspects of treatment including diet, exercise, medication, footcare, urine testing and general aspects of care. Each question has three possible responses: True, False and Don't Know. The directions ask that each participant try to answer all of the questions but not to guess if unsure of the correct response.

The Posttest. Part A consists of twenty true-false questions. In order to provide some basis for comparison, an attempt was made to parallel each question in this section to the true-false questions on the pretest. When the correct answer is True on a pretest, the item has been reworded so the correct answer is False on the posttest. The same has been done for questions with False as the correct answer on the pretest. Only three questions have been repeated on the posttest without change. Part B consists of thirteen multiple choice questions. In this section, items are more difficult, and are designed to test a higher level of comprehension about the disease and the therapeutic regimen. As in the pretest, the written directions ask participants to try to answer all of the questions but not to guess.

Each test of knowledge was colour-coded. The pretest was printed on green paper. The posttest for use at the end of the education program was printed on blue paper. For the follow-up test, the items on the post-test were re-ordered. The format was changed so that squares were placed in front of each possible answer rather than blank lines. The follow-up test was printed on yellow paper. These steps were taken to counteract the possible effects of test wiseness. Appendix D contains the pretest of knowledge. Both forms of the posttest are contained in Appendix E.

Skills Performance Checklists

Four skills performance checklists were developed for use when observing subjects' demonstration of specific skills including: (1) urine testing, (2) preparation and administration of insulin injections, (3) the administration of oral hypoglycemics, and (4) footcare.

The checklist for urine testing was adopted from the instrument developed by D. Nickerson of the University of Florida Department of Medicine (1972:935-938). A section was added for the testing of urine by the Diastix method.

The checklists for insulin injections, oral hypoglycemics, and footcare were developed by analyzing the tasks, breaking them down to component parts, and formulating each part into a concrete action. The criteria developed by Watkins et. al. (1967a) provided guidelines for the insulin adminstration checklist. The work of V. Engel (1973:61-74) provided assistance in the development of the footcare and oral hypoglycemic checklists. Each checklist adopted a similar format for ease of recording when the skills were being observed. Appendix F contains the checklists used in the collection of data.

The Interview Guide

An interview guide was constructed to assess each subject's perception of how he or she was complying with the prescribed therapeutic regimen during the time from the completion of the education program to the follow-up visit.

It was expected that the subjects would be heterogeneous in terms of a number of variables including age, educational achievement and ethnic background. For this reason, a standardized, nonscheduled interview format was adopted. Gorden (1975:61) states:

> The nonscheduled interview gives the interviewer some choice as to the order of questions, freedom to attempt alternative wordings of the same question, and freedom to use neutral probes if the first response to a question is not clear, complete or relevant.

This format allows the collection of the same categories of information from each subject while permitting some variation in the way questions are asked so that individual differences may be considered.

The interview guide was constructed using the five selected aspects of the therapeutic regimen as its basis. Questions were developed concerning the extent to which the regimen was followed, changes in normal routine and lifestyle, problems encountered in following the regimens, concerns not addressed in the education program, and suggestions for topics to be included as part of the education program. The interview guide is contained in Appendix F.

Validity of the Research Instruments

Validity, or the extent to which an instrument measures what is it is supposed to measure, was a major concern when developing instruments for use in this study. Kerlinger (1974:458) states:

> Content validation is guided by the question: Is the substance or content of this measuring instrument representative of the content or universe of content of the property being measured?

Content validation requires a judgment to determine the representativeness of the content of a measurement instrument. A number of procedures were carried out to ensure content validity of the research instruments.

Once the first drafts of the instruments were completed, they were sent to eight experts for review. The experts include a diabetes nurse educator, a hospital unit supervisor of a unit admitting many diabetics, four nurse educators involved in teaching diabetes to nursing students, an in-service nurse educator, and a family practice manager with experience both as a nurse educator and as a physician's assistant in a family-practice setting. The reviewers were asked for comments on the appropriateness, clarity, and completeness of each research instrument. They were also asked to provide suggestions about any areas of concern.

Based on information received from these sources, the instruments were then revised. Wording was clarified. The skills checklists were simplified to become less nurse-oriented and more patient-oriented. The interview guide was expanded to include subjects' perceptions of the helpfulness of various health care personnel involved in their learning.

The Pilot Test. A pilot test was conducted for two purposes. The first was to test the instruments. The second was to gain suggestions from the perspective of persons with Diabetes Mellitus. The revised drafts of the instruments were tested with three diabetic individuals. Each person had been diabetic for over two years, had undergone a patient education program and was successfully managing his or her therapeutic regimen. The success was inferred from the fact that none of the members of the pilot group had required hospitalization or repeat attendance at an education program to control the disease or its complications during the past two years.

To ensure readability and the understandability of the knowledge tests and interview questions, the instruments were also tested on three lay people who had no formal education about diabetes. They were asked to relate their understanding of what each question was asking and for suggestions to improve wording.

Based upon the results provided by these two groups, the research instruments were again revised and a final draft of each instrument was developed.

Reliability. As this study was exploratory in nature, using the research instruments in this form for the first time, the issue of reliability was not directly addressed.

II. SOURCES OF DATA

The research was conducted from May to September of 1981 in a major metropolitan city in Alberta.

A copy of the research proposal and the research instruments was submitted to the Assistant Executive Director - Nursing and then to the Clinical Investigation Committee of one hospital. The study was approved with the provision that the physician of each subject gave his consent for his patient to participate in the study.

The original intent was to obtain all of the subjects from one institution, however there were very few individuals that met the criteria for inclusion in the study during the first two months. The fact that some hospital beds were closed due to staff shortages during this period, with the result that admissions to the hospital were on a priority basis, may have had some effect on the numbers of potential subjects. There was not a population who could be asked to participate in the study. Individuals must first be diagnosed and plan to attend the patient education program before they could be asked to participate. For these reasons, and because of time and and financial constraints, the decision was made to utilize two institutions to obtain subjects. Permission was sought and granted to utilize individuals undertaking an education program about diabetes at a metabolic centre in the same city.

The Sample

A total of sixteen individuals were approached to participate in the study. These were individuals who were diagnosed as being diabetic, were willing to participate in the study, could speak and read English fluently and lived in an area in Alberta easily accessible to the investigator for the follow-up phase of the data collection.

Administrators in both institutions were concerned that the selected subjects understood and consented to the fact that a follow-up visit to the home was part of the research design.

Of the sixteen individuals asked, two refused. One agreed to participate but subsequently withdrew. He gave as his reason the fact that his wife was unwilling to have someone visit their home. Another person declined because his job involved frequent travel throughout Canada. He could not guarantee when he would be back in the city.

One subject withdrew from the study after the first phase had been completed. When telephoned to make arrangements for the follow-up visit, he told the investigator that he had been hospitalized for eye surgery shortly after completing the education program. He stated that he was told at that time that the blood tests taken did not show any abnormality and he was, therefore, not required to follow a diabetic regimen.

Two subjects who began the study had moved and could not be contacted to complete the follow-up phase. Another subject declined to participate in the follow-up interview. Of the original fourteen subjects who began the study, a total of ten completed all of the phases.

Five of the subjects in the sample had been told previously that they had Diabetes Mellitus but had not received any type of systematic instruction about the disease. None of these individuals had adhered to a diabetic diet, followed urine testing and exercise routines or taken special care of the feet. One had refused any type of treatment until this hospitalization. Three had received treatment with oral hypoglycemics only. In each case, there had been a worsening of the condition, to the point that four of the subjects now required daily insulin injections to help control the illness.

Even though these individuals had been diagnosed as being diabetic in the past, they were included in the study for several reasons. They had little knowledge about diabetes. Their conditions had deteriorated. They were attending classes to learn about diabetes for the first time. Each would be required to learn new knowledge, skills, and attitudes. Changes in behaviour would be necessary if they were to successfully follow their new therapeutic regimens. Cohen (1975:5) has stated that changing old health habits is just as hard as, if not harder than, learning new ones.

Characteristics of the subjects are discussed in detail in Chapter Four and Chapter Five.

The Settings

The Hospital

The hospital is a 1,000+ bed active treatment facility. It has an established program for diabetes education, which is offered weekly. The classes provide information about diabetes and aspects of the diabetic regimen, however clinical management (adjustments in the therapeutic regimen) is the responsibility of the patients' physicians.

The classes consist of four one and one-half hour classes which are held from Monday to Thursday. Three of the four classes are conducted by a diabetes nurse educator and one class is conducted by a dietitian. In-hospital patients make up the majority of those attending the classes. As well, some individuals are sent by their physicians to attend the classes on an out-patient basis. Relatives are encouraged to attend.

Although the classes provide the basic information about diabetes and its management, the material requires reinforcement and supplementation by the professional staff on the hospital units. A teaching checklist is available for use with diabetic patients. It is expected that this checklist will be completed as teaching is provided to the patients and they demonstrate the learned behaviours. Appendix B contains a detailed outline of the content of the classes and a copy of the teaching checklist.

The Centre

The centre is affiliated with an acute care hospital. It provides a comprehensive four-day education program for diabetic individuals and their relatives. The clinic adopts a team approach to the education of its clients. The staff is composed of two physicians specializing in the treatment of diabetes, a registered nurse, and a registered dietitian. A pharmacist provides consultative services. Support staff include a dietary aide and lab technician. The centre is utilized as a teaching centre with student interns and student dietitians rotating through learning experiences. As well as providing an education program, the professional staff participate in the clinical management of clients, making appropriate adjustments in the therapeutic regimens.

The program is an intensive course in the self-management of diabetes. The majority of clients are out-patients, referred to the clinic by their personal physicians. The majority live in Alberta, though some are referred from other provinces. The program, which is held from Monday to Thursday begins at 0730 hours and ends at 1500 hours each day. As well as attending lectures, clients are expected to learn and demonstrate their ability to carry out aspects of their therapeutic regimens. They are present for two meals and snacks which they must plan and select. These activities are supervised by the dietitian. The clients must test their urine and take their diabetic medications under the supervision of the nurse. They are also taught how to test their own blood sugars. They see one of the physicians daily, during which time physical examination, medical treatment, and individual instruction is provided. Individualized counselling and instruction is provided by professional members of the staff.

Appendix C contains a detailed outline of the clinic program.

III. METHODS USED TO COLLECT DATA

Phase One - The Education Process

The Hospital

The physicians of selected individuals were contacted for permission for the subjects to participate in the study. All of the physicians contacted gave their permission. Then each subject was visited by the investigator to explain the purpose of the study and to obtain written consent for participation. The purpose of the study was explained as "an attempt to see how people with diabetes fit the recommendations made by their doctors into their daily lives." The exact intent of the study, that of examining the relationship between levels of knowledge and compliance, was not mentioned.

In studies about compliance a major problem is balancing the integrity of the study with the right of the subject to informed consent. If subjects are aware that compliance behaviours are being studied, that knowledge will likely affect the subjects' actions during the data collection process (Sackett and Haynes, 1976:66). At the same time subjects are entitled to an explanation of the purpose of a study in which they are participating. Ethical considerations precluded giving subjects a fictitious purpose. It was decided to word the statement of purpose in general terms and avoid the word compliance in any explanations or conversations with subjects.

The participation required of each subject was explained and a typed information sheet provided. A consent form was signed at this time. Copies of these two forms are contained in Appendix A.

When consent had been obtained, the pretest of knowledge was administered. Delays in receiving physician approval resulted in two subjects commencing classes before a pretest could be administered. Subjects were observed for their reactions for at least one-half of the classes. After the education program was completed, each subject was given a posttest. Each subject was observed demonstrating the applicable skills included in his or her prescribed therapeutic regimen.

During the course of the study, it was discovered that it was not possible to observe the performance of footcare with all of the subjects. Many carried out the procedure in the bathtub. If the footcare procedure could not be observed, subjects were asked to outline specifically what they would do for this aspect of the regimen. At the conclusion of this phase of the data collection, subjects were told they would be contacted in five weeks to arrange a time for the follow-up visit. They were told that the visit would be made by the investigator at a time of mutual convenience.

The Metabolic Centre

The full schedule of activities included in the education program provided by the centre prevented the investigator from explaining the purpose of the study and obtaining subjects' consent prior to the commencement of classes. With the permission of the staff, the pretest was administered to all of the diabetics and their relatives before lectures began on the first day. During free time that day, the investigator approached potential subjects to explain the purpose of the study and to provide the typed information sheets. The subjects were asked for their written consents at this time.

Subjects were observed for at least one-half of the time spent at the centre to note reactions to the education program. At the conclusion of the program, the posttest was administered. On the last day of classes, subjects were observed demonstrating urine testing procedures and the administration of insulin or oral hpoglycemics. As the clinic did not have facilities for footcare, subjects were asked to outline what they would do when carrying out this procedure at home. As with those at the hospital, centre subjects were told they would be contacted in five weeks to arrange a follow-up visit at a time of mutual convenience.

Observer Role

While subjects were attending classes, the investigator assumed the role of participant observer in the learning process for at least one-half of the time to observe reactions to the education programs.

> Participant observation is a technique wherein a researcher participates in the functionning of the social group that is under investigation. The aim of this approach is to secure insights and sources of information which would probably be unobtainable in other ways. Proponents of the participant observation approach claim that it represents both a source of data and a basis for understanding what the data mean. The participant observer strives to secure information within the contexts, experiences, structures and symbols that are relevant to the subjects. The researcher endeavors not to interject his or her world views and meanings into the social situation under observation (Polit and Hungler, 1978: 306-307).

The investigator was introduced to each group as a nurse present to conduct research who would be attending classes. Further explanations were provided by the investigator on an individual basis. The investigator attended classes and participated in the educational activities.

During free times and during periods of socialization a subject would occasionally direct a question to the investigator about material presented in the classes. In order to avoid a teaching rather than observing role, the investigator referred the subjects to appropriate staff members for assistance.

Phase Two - The Follow-Up Visit

Follow-up visits to subjects were made over a period of time ranging from six to thirteen weeks. Reasons for the wide variation in time included vacations, business trips, and hospitalizations.

Three of the visits could not be made in the subjects' homes. One subject, with a transient lifestyle, had no permanent address. When in the city, he stayed with various friends. This interview was conducted in a restaurant. Another subject, although initially consenting to participate in all phases, expressed strong concerns about someone visiting his home. He did, however, consent to the visit as long as it could be held somewhere else. To accommodate his wishes, the follow-up visit was held in the investigator's home. The third subject had been re-hospitalized for several weeks. Her condition had improved, but it was uncertain when she would be well enough to return home. The interview was conducted in her private room at the hospital.

During the course of the follow-up visit, the subject was asked to demonstrate the applicable skills of the therapeutic regimen. He or she was then asked to complete the follow-up posttest. The remainder of the visit was spent in carrying out the interview.

Subjects were asked for permission to record the interview by means of a tape recorder. If they objected, or if in the opinion of the investigator the presence of the recorder was inhibiting responses, the tape recorder was turned off. Five interviews were taped, and five were not. Field notes were made during those interviews which were not taped. As soon as possible after the interviews were terminated, the field notes were expanded.

Subjects were made aware of their rights to refuse to answer or participate in any aspect of the data collecting process. All of the subjects were willing to participate in the various activities in the follow-up visit.

IV. ANALYSIS OF THE DATA

The study was exploratory and descriptive. The number of subjects was ten. Procedures for statistical analysis would not be appropriate because of the nature of the study and the limited number of data sources.

The tests of knowledge were marked and analyzed. Pretest, posttest and follow-up posttest scores for each subject were compared. Answers were examined to identify areas where knowledge was lacking.

The checklists used to assess the performance of selected psychomotor skills for each subject were examined to determine if changes had occurred between the first observation and the observation at the follow-up visit. Each checklist was examined for specific areas where subjects had failed to follow procedures which had been taught.

Content analyses were performed on the information obtained from the follow-up interviews. The information was examined to determine patterns of response and compliance with prescribed therapeutic regimens.

The information obtained from the various data collecting procedures was organized and presented utilizing the format of individual case studies.

The data presented in each case were then analyzed to identify common patterns amongst the subjects in terms of levels of knowledge and compliance with therapeutic regimens. Suggestions made by the subjects were summarized and classified.

SUMMARY

This chapter described the methodology of the study. The areas discussed include construction of the research instruments, sources of data, methods used to collect data and procedures used for the analysis of the data.

CHAPTER IV

FINDINGS OF THE STUDY: CASE STUDIES OF INDIVIDUAL SUBJECTS

This chapter reports the findings of the study for each of the ten subjects included in the sample. The information obtained from the various sources of data collection such as tests of knowledge, observations of skills performance, observations of subjects while participating in the education programs and follow-up interviews are presented utilizing a case study format.

Each case study consists of six major sections: (1) a personal profile, (2) a description of the diagnosis and education process, (3) results of the tests of knowledge, (4) the results of the observations of skill performance, (5) a discussion of the compliance of each subject with the various aspects of the prescribed therapeutic regimen, and (6) the individual's reactions to the education experience together with his or her concerns and suggestions for change. A summary of the knowledge levels, skills performance and compliance achieved by the individual in following his or her prescribed therapeutic regimen is provided for each case study.

A large amount of information, some of it repetitive, was collected from each subject. To prevent the case studies from becoming too lengthy, the decision was made to summarize the findings of each phase of the data collection process and to present the important aspects in the case studies. For this reason, tables were developed to summarize the results of the knowledge tests. As well, rather than including complete verbatim transcript of interactions, significant statements made by the subjects have been selected and used as illustrations in the texts of the case studies.

CASE STUDY NUMBER ONE

Personal Profile

Subject No. 1 is a forty-eight year old male. He has a grade five education and has worked as an insulator for most of his adult life. Prior to his latest hospitalization the subject was unemployed and receiving social assistance. He is divorced and has one teenage daughter whom he sees occasionally. The subject does not have a permanent residence. He stays with friends and has moved several times within the past year.

The subject was treated for tuberculosis eight years ago. Six years ago, he was told by a physician that he had diabetes and would have to take insulin. He refused treatment and did not receive any education about diabetes. In March 1981, the subject was in an accident which resulted in a broken left ankle and damage to the ligaments of the left knee. He underwent surgery for the correction of this problem. He currently wears a corrective brace on his left leg.

Subject No. 1 has a long history of alcohol abuse. He drank up to two twenty-six ounce bottles of whiskey a day. On this admission to hospital, he said he was drinking two to four bottles of beer a day with "occasional binges."

Diagnosis and Education

The subject was admitted to the hospital complaining of excessive thirst, going to the bathroom frequently, and lacking energy. He also felt very weak and shaky. His admission blood sugar was 241 mg/dl. The admitting diagnosis was Uncontrolled Diabetes Mellitus.

On physical examination, the subject was found to have alcoholic neuropathy of the right leg with significant weakness of plantar and dorsi flexion and sensory loss. His blood sugars were: fasting - 148 mg/dl.; 1000h - 234 mg/dl.; and 1400h - 265 mg/dl. The subject was placed on a 1,200 calorie Canadian Diabetes Association (hereafter referred to as C.D.A.) diet. He was shown how to test his urines and do footcare by the staff on the unit. He was started on oral hypoglycemic therapy (Diabeta 2.5 mg. daily) but it was discontinued by the physician after one dose.

The subject attended classes for a four-day period. He was unaccompanied by a relative or friend. He attended all the classes and appeared attentive. He asked two questions during the course of the four lectures, both concerning diet. He did not take notes. When asked if he had read the handouts given in class, the subject said he had not, but would do so when he had time.

The subject was visited twice by a hospital dietitian to provide diet counselling. A diet for days of illness was reviewed with him as was the plan for an 1,800 calorie C.D.A. diet prescribed for when he went home. The charting of the dietitian reflected a concern about how well the subject would follow the diet when he went home.

Knowledge Performance

The Pretest

Part A. When asked to describe what diabetes meant to him, subject No. 1 displayed a superficial knowledge. The responses consisted of two statements: "You are sick," and "You have a problem with sugar and must watch the food and the booze." The only diabetic person that the subject had previous contact with was the father of a friend. From him the subject learned that: "Diabetics need insulin," and "You must watch the diet." The only other statement made was, "You have to take care of your feet. This guy had to have an amputation because he didn't."

Part B. The subject scored 14/20 on the true-false questions. An analysis of the responses in this section show that areas where knowledge was either incorrect or lacking were fairly evenly distributed over the seven categories of questions. Only in the area of general health practices did the subject answer all of the questions correctly. The results of this analysis are presented in Table I.

The Posttest

The subject scored 29/42 on the posttest. The results were 15/20 on Part A and 14/22 on Part B. He was unable to answer questions involving relationships between aspects of the disease involving control. For example, on Part A, he incorrectly answered the item testing the relationship between weight, medication and diet and the item concerning the relationship between infection and insulin needs. He did not clearly understand the principles of a diabetic diet and was unable to differentiate the symptoms of hyperglycemia and hypoglycemia. The two

Table I

Frequency Distribution of 'Right', 'Wrong', and 'Didn't Know' Answers on Part B of the Knowledge Pretest According to Category of Question.

Category of Question		Right	Wrong	Didn't Know
Characteristics of Disease	(5)	3	1	0
Medications	(4)	3	0	1
Diet	(3)	2	1	0
Footcare	(3)	2	0	1
Urine Testing	(2)	0	0	1
Exercise	(1)	1	0	1
General	(2)	2	0	0
Total	20	14	2	4

Table II

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-up Posttest According to the Category of Question

		Posttest			Follow-up Posttest		
Category of Question		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of Disease	(12)	10	2	0	10	2	0
Medications	(5)	2	1	2	2	1	2
Diet	(8)	5	3	0	5	2	1
Footcare	(3)	3	0	0	3	0	0
Urine-Testing	(2)	2	0	0	2	0	0
Exercise	(2)	1	1	0	0	1	1
General	(3)	2	1	0	3	0	0
Complications	(7)	4	2	1	5	1	1
Totals	42	29	10	3	30	7	5

( ) Number of questions in each category

questions on exercise received contradictory responses.

The Follow-up Posttest

The subject scored 30/42 on the follow-up test with 15/20 on Part A and 15/22 on Part B. The knowledge level remained relatively consistent over the ten-week period between administrations of the posttest. An analysis of responses to the two administrations of the posttest is shown in Table II. While there is some variation in the 'Wrong' and 'Didn't Know' responses, the amount of correct knowledge is almost unchanged. In the follow-up posttest, the subject continued to incorrectly answer questions concerning the various aspects of diabetic control.

Skills Performance

After completion of the education program Subject No. 1 was asked to demonstrate the urine testing and footcare procedures. He followed the correct procedure for testing urine using the Ketodiastix method. He was able to interpret the results correctly and name the appropriate times that his urines should be tested. The subject soaked his feet during his bath so this was not observed, but he was observed applying lanolin ointment. He applied the ointment correctly. He said that he periodically checked his shoes and that he never went barefoot.

At the follow-up visit, the subject tested the urine correctly using the Diastix method. He interpreted the results accurately. Although able to identify the correct times for testing, he said that he did it only in the early morning and late evening. The need to test his urine two hours after meals was not understood. He stated that he did footcare daily and outlined the proper procedure in detail. The subject volunteered the information that he did it every day because "I don't want to lose a foot like my friend's father did."

Compliance with the Prescribed Therapeutic Regimen

Medication

The subject was not taking any medication to control his diabetes.

Diet

The subject understands that diet is important in controlling blood sugar. "It helps keep the blood sugar down." Although he understands its importance, he does not follow the prescribed diet plan except to avoid concentrated sweets. He does not spend time planning his meals, nor does he purchase any special foods. He does not weigh or measure his foods. Meals and snacks are not eaten at regularly scheduled times. "I eat when I'm hungry." The subject eats out often (five to six times a week) and orders what he wishes. He does not include all of the basic food groups either in the meals he makes or the meals he buys. He said that he eats fruits and vegetables only when he feels like it. During the course of the interview the subject ate supper. It was after 2100 h. He ordered and ate a grilled cheese sandwich, a glass of milk and two bottles of beer. He drinks between three and six bottles of beer a day which he does not calculate into his diet. "Why should I? I'm healthy. After all, I've lost fifteen pounds." He has not spoken to a dietitian since he was was discharged, nor does he plan to. According to the subject he has not seen his doctor since discharge but he has an appointment within the next two weeks.

Urine Testing

Subject No. 1 tests his urine twice daily, in the early morning and at bedtime. He knows he was told to test it four times a day but he says that "its difficult to do when I'm travelling with the guys." A double-voided specimen is not used. The subject does not know what the term means. The subject states: "My urines are always good - negative or trace." He says that he records his urines in his daily diary and plans to show the results to his doctor. When asked by the investigator if she could see his diary, the subject did not answer the question and changed the topic of conversation.

Footcare

Footcare is done daily as taught in the hospital. The subject knows that it is important to do because, "diabetics are slow to heal." He states: "I already have a problem with my foot. I don't want it to get infected and lose it." If any problems arise about his feet, the subject plans to contact a doctor at once.

Exercise

Subject No. 1 states that his exercise level has increased since he was in the hospital. Before hospitalization, he had little exercise as he was "sitting at home all day hitting the booze." He now has a job selling door-to-door and estimates that he walks between five and fifteen miles a day. He has no regular exercise outside of this job and has no regular exercise on weekends. He does not alter his food intake to balance the decreased level of exercise on weekends. The subject does not remember what he was told about the importance of exercise in the classes and is not sure whether his doctor spoke to him about it. When asked how he felt about the purpose of exercise, the subject explained: "It helps you feel better." He has no plans to develop a regular exercise program during the cold weather when this job will be finished.

Effects of the Disease

The subject feels much better now than when he was first hospitalized. All his symptoms have disappeared. He has noticed little change in his life since coming home from the hospital. According to him, the major problem with diabetes is "cutting down on the booze." Although his health has been good, he has noticed that he heals more slowly than he previously did. He burned his hand while cooking and found that it healed very slowly. It became infected and he treated it with an ointment purchased at a drugstore. "I didn't want to bother the doctor with a little thing like that."

Diabetes has not prevented the subject from doing anything that he wishes. The subject has told his friends and relatives that he has diabetes. When asked about their reactions he stated: "No problem." He always carries a diabetic identification card in his wallet.

When asked if he does things that he knows he probably shouldn't, the subject responded: "I know I should cut out the booze, but I know I'll never do it." When asked if it came to a choice between stopping drinking or going on insulin, the subject was very definite. "I won't quit drinking. I'd rather die first. They tried to put me on insulin before and I told them no way. I feel the same now. I'd kill myself first."

Reactions to the Educational Experience

Subject No. 1 feels that he learned most about the disease from the lectures at the hospital and from the nurses on the unit. The nurses taught him how to test his urines, how to do footcare, how to follow a daily routine and how to care for himself. The diabetes nurse educator who conducted the lectures was the person identified as being most helpful in assisting him to care for his diabetes.

The subject's doctor provided explanations about what diabetes is, why he should quit drinking and why he should follow the diet. The subject is satisfied with the explanations he received.

When asked what he learned from the dietitians, the subject replied that he couldn't say specifically except to avoid concentrated sweets. The subject became quite excited when discussing the dietitians. He raised his voice and began gesturing with his hands. He expressed concern about the dietitians not sending foods he had ordered on his menu and instead, sending foods he didn't like. He often didn't eat the food on his meal tray and went to the coffee shop to "buy some decent food."

The subject has no suggestions for topics or information which he would like to see added. He has no questions or concerns about diabetes but said if he did, the person he would contact is the diabetes teaching nurse at the hospital.

Summary

The subject demonstrates good understanding of simple facts but shows difficulty with some of the more complex questions, particularly those testing the interrelationship of factors important in maintaining diabetic control. He is able to perform the skills involved in his prescribed therapeutic regimen very well. He demonstrates them correctly as taught.

The subject complies completely with only one aspect of his prescribed regimen. He performs footcare daily as taught. Fear seems to be a motivating factor in carrying out this aspect of care. He referred several times to the diabetic father of a friend who had lost a foot. He partially complies with the urine testing aspect, but adapts it to suit his convenience. There is virtually no compliance with diet except to avoid concentrated sweets. Exercise is carried out regularly only in the performance of his job.

It is questionable whether this individual really accepts the fact that he is diabetic. He refuses to make any changes in his lifestyle to accomodate the fact that he has diabetes. He displays knowledge and understanding of what he should do, but does not incorporate this knowledge into his life except as it suits his convenience. Even in the relatively controlled environment of the hospital, he did not comply with dietary treatment.

Alcohol appears to be of major importance to this subject and he has no intention of stopping drinking in spite of the fact that he is aware that it will affect his condition negatively.

The subject does not transfer learning consistently. He said he would contact a doctor immediately if he had any problem with his feet, but when he burned his hand, he treated it by himself.

He has no concerns or suggestions about the education program. He said he would contact his physician or the diabetes teaching nurse if he encountered problems, but in the ten weeks following discharge, he has done neither.

CASE STUDY NUMBER TWO

Personal Profile

Subject No. 2 is a fifty-three year-old married female with two children. She lives with her husband and fifteen year-old son in her own home. Her daughter is married with one child. The subject completed a high-school education. She works full-time as a secretary-manager in a business office. Her husband, who is retired, is in poor health. In recent years he has had four cardiac by-pass operations. The subject is continually concerned both about the state of his health and how he will react to new stresses such as her illness.

The subject is familiar with hospitals and their routines. She has had several hospitalizations for surgery. In the last two years, the subject has experienced a number of problems with her gastrointestinal tract. In 1980 she was hospitalized with gallstones. For the three months prior to this admission, she has been on a liquid-semisolid diet because of nausea which occurs just after meals.

Diagnosis and Education

The subject states that she was told by a physician that she was a "borderline" diabetic three years ago. At that time, she was placed on oral hypoglycemic therapy (Glucophage 500 mg./twice a day). She states that she was not given instruction about the need for a special diet, urine testing or footcare. She was not advised to attend a diabetes education program. The subject states: "I was not too concerned at the time about diabetes because I was told that the pills would control it."

The subject was admitted to hospital primarily because of problems with her stomach. She complained of nausea, vomitting, diarrhea and a dull pain in the right upper quadrant of her abdomen. Other symptoms she experienced included severe thirst, frequent urination and fatigue. Her admission blood sugar was 320 mg/dl. Significant findings from the physical examination included a mass in the right upper quadrant and a recurring infection in the left great toe as a result of an ingrown toenail. Her admitting diagnosis was Undiagnosed Abdominal Pain and Uncontrolled Diabetes Mellitus. Her blood sugars were: fasting - 182 mg/dl.; 1000h - 242 mg/dl.; and 1400h - 153 mg/dl.

She was placed on a 1,000 calorie C.D.A. diet. Urine testing and footcare procedures were taught by the unit staff. Two days after admission, the subject was started on insulin therapy to control the blood sugars. She was initially placed on sliding scale injections and then on Lente insulin daily. The diabetes nurse educator supervised her learning experience for insulin injections. On the weekends, she was supervised by the unit staff.

The subject attended diabetic classes over a two-week period. She was unable to attend all four classes during the same week because she was undergoing a series of diagnostic tests to determine the cause of her abdominal pain and nausea. Her husband and son did not accompany her to classes. She participated actively in the learning sessions. She took extensive shorthand notes which she reviewed each evening with the handouts circulated in class. After reviewing her notes, the subject would prepare a list of questions to ask her doctor or the diabetes teaching nurse the next day. She asked many relevant questions in class concerned with all aspects of the regimen.

Subject No. 2 received diet counselling from a hospital dietitian. A diet for days of illness and for a 1,400 calorie C.D.A. diet were reviewed with her. Dietary intake during hospitalization was a problem because of the subject's frequent bouts of nausea and vomitting as well as the need to withold food and fluids prior to diagnostic tests. As a consequence, her insulin required frequent adjustment. She experienced two attacks of severe hypoglycemia while in hospital. The subject was in the hospital for a total of twenty-two days. She was discharged on a 1,400 calorie C.D.A. diet and 20 units of Lente insulin daily. She was told to see her surgeon in two weeks for an incision and drainage of her infected toe.

During the time between this discharge from hospital and the follow-up interview, the subject experienced a number of problems. She had a severe insulin reaction during the night and did not know what to do. She could not take sugar because of her nausea. Her husband had to phone two hospital emergency departments before receiving assistance that was helpful. Following the incision and drainage of her toe, the subject developed an infection in the site that she was not aware of. She developed a severe fever with the recurrence of nausea and vomitting. When the investigator telephoned the subject to arrange the follow-up interview, the subject was very upset. Her fever was worse, her foot was very sore, her blood sugars were high and she could not keep any food in her stomach. The subject was advised to contact her physician as soon as possible. Upon calling back, the subject's son informed the investigator that the subject had been re-hospitalized and was in isolation because of severe infection. The follow-up visit was carried out while the subject was in hospital but was delayed until her condition had improved and she was no longer in isolation. Thirteen weeks passed between the completion of the education program and the follow-up interview.

Knowledge Performance

The Pretest

Part A. The subject had been reading about diabetes prior to commencing classes. She had asked for and received some pamphlets about diabetes from the nursing staff on her unit. When asked to describe what diabetes meant to her, the subject answered the question in depth. She discussed the fact that diabetes resulted from insufficient insulin, the concept of diabetic control and the importance of a diet containing a limited amount of sugar. She also identified normal blood sugar levels and discussed renal threshold and urine testing. She stated that she had a friend who was diabetic but did not learn much from him as she felt uncomfortable asking him questions. She gained most of her information from reading the books and pamphlets provided for her.

Part B. The subject scored 17/20 on the true-false questions. She did not know that circulation to the feet was a problem with diabetes. She thought that insulin could be administered in pill form.

She was unaware of the effect of fever on a diabetic's need for insulin. Table III provides an analysis of the subject's responses to Part B of the Pretest.

The Posttest

The subject scored 36/42 on the posttest with 20/20 on Part A and 16/22 on Part B. She incorrectly identified the time that an insulin reaction is most likely to occur in a diabetic taking an intermediate-acting insulin. She incorrectly identified free foods for a diabetic diet and incorrectly responded that foods could be substituted from one exchange list to another. She was unable to clearly differentiate between the signs of hyperglycemia and hypoglycemia.

The Follow-up Posttest

On this test, Subject No. 2 scored 34/42 with 17/20 on Part A and 17/22 on Part B. She made the same errors as she had made on the posttest as well as incorrectly identifying how often injection sites should be rotated. She incorrectly answered the question asking about the first thing a diabetic should do when he feels an insulin reaction starting. Her response was to test the urines. In view of the reactions she had experienced, it was a surprising answer. Table IV presents an analysis of the responses of the subject to questions on the posttest and follow-up posttest of knowledge.

Skills Performance

Subject No. 2 was observed preparing and administering insulin, testing a urine specimen and peforming footcare on the day prior to discharge. She drew up and administered the prescribed dosage of insulin

Table III

Frequency Distribution of 'Right', 'Wrong', and 'Didn't Know' Answers on Part B of the Knowledge Pretest According to Category of Question

Category of Question		Right	Wrong	Didn't Know
Characteristics of Disease	(5)	4	1	0
Medications	(4)	2	1	1
Diet	(3)	3	0	0
Footcare	(3)	3	0	0
Urine Testing	(2)	2	0	0
Exercise	(1)	1	0	0
General	(2)	2	0	0
Total	20	17	2	1

Table IV

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-up Posttest According to the Category of Question

		Posttest			Follow-up Posttest		
Category of Question		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of disease	(12)	12	0	0	12	0	0
Medications	(5)	4	1	0	2	3	0
Diet	(8)	5	2	1	6	2	0
Footcare	(3)	3	0	0	3	0	0
Urine-Testing	(2)	2	0	0	2	0	0
Exercise	(2)	2	0	0	2	0	0
General	(3)	3	0	0	3	0	0
Complications	(7)	5	2	0	4	3	0
Totals	42	36	5	1	34	8	0

( ) Number of questions in each category

without contamination. When drawing up the insulin, the subject inverted the vial before injecting air but she corrected this without prompting. Prior to injecting the insulin, she did not palpate the site or inspect it for atrophy. She stated afterwards that she was not aware that these steps should be carried out and asked questions about the reasons for doing them. She performed the footcare procedure correctly. The subject stated that she was aware of its importance because of her infected foot. She performed the urine testing procedure correctly using the Ketodiastix method.

When drawing up the insulin at the follow-up interview, the subject did not observe the presence of a large air bubble. She placed the syringe on a table and contaminated the needle. When picking up the syringe, she touched the needle. She did not observe either instance of contamination. Prior to injecting the insulin, she did not palpate the site or inspect the area for atrophy. After withdrawing the needle, she rubbed the injection site vigorously. The subject performed footcare on one foot only. The other foot was bandaged and the dressing was changed daily by the nursing staff. The correct procedure was followed. The urine test was carried out using the Ketodiastix method. All of the steps were carried out correctly except for the timing during the procedure. She did not use her watch to time the test. She stated that she counted the seconds. Her timing was between 5 and 10 seconds too long on both parts of the test.

The unit supervisor told the investigator that it had been strongly suggested to the subject that she attend the diabetic classes for review. The subject refused to go stating: "I know all that I have to to take care of myself."

Compliance with the Prescribed Therapeutic Regimen

Medication

The subject is presently taking 40 units of Lente insulin every morning. When first discharged from hospital, she was taking 16 units of Semilente insulin and 26 units of Lente insulin. The change in amount and type was necessitated by chages in her physical condition. The subject takes her insulin regularly at 0700 h. She gives it herself or has her husband or son give it. She changes the site daily using a clockwise rotation. At first, she found that it took her a long time to prepare and administer the insulin. Her vision was blurred and she had trouble seeing the unit markings on the syringe. If unsure, she would ask her husband or son to check it for her. She also had them give her injections in areas she could not easily reach or when she felt unwell. Her husband and son were both "very apprehensive at first, but after a couple of times they had no problems at all." The subject does not feel that the need for a daily injection has caused much change in her routine. She has always been an early riser. Once the routine had been established and her vision cleared, she experienced no difficulty. She is able to purchase the necessary equipment at her local pharmacy. She notices that the one thing that makes her insulin needs change is the presence of infection. When this occurs, she must increase her insulin dosage to keep her blood sugar within normal range.

Reactions and Other Illnesses

Subject No. 2 has had two severe insulin reactions at home. One was during the day and one was at night. She became hungry, shaky and began to perspire. She treats the reactions by taking concentrated glucose in the form of orange juice with two teaspoons of sugar added. On the day following each of the reactions, the subject decreased the insulin dosage to prevent a recurrence of hypoglycemia. The doctor was informed of each reaction. His advice was to make sure she ate all her meals and snacks and to eat them on time. Her reactions caused concern to her husband and son. However, both are now aware of what action to take. They remind her to eat her meals and snacks if she is late.

Her health has been poor while at home. She has not returned to work. Her foot infection worsened and she developed a fever. Her blood sugar became very elevated. She was reluctant to increase her insulin dosage as she was not eating well and was afraid of experiencing another insulin reaction.

Diet

The subject understands that diet is important "to maintain control of the blood sugars." She says that she tries to follow the diet as much as possible, but gives conflicting information about the extent of her compliance with the prescribed diet. She says that she has followed the diet very closely because her blood sugars have been high. "I've been keeping the diet very controlled so that the insulin can be adusted." She also states: "I can't eat the entire 1,400 calories. It's too much. I want to lose weight but feel it's not fast enough." She has lost twenty-one pounds since commencing the diet.

The subject plans and cooks her meals one day at a time using the information received at the diabetic classes, as well as a recipe book purchased from the local Canadian Diabetes Association office. Foods are either weighed or measured. The subject has not yet eaten at a restaurant. She is "very careful when dining with friends." The same routine is followed on weekends as during the week. She has not noticed a significant change when shopping for foods except that she now purchases more fresh fruits than previously. Food costs have remained unchanged. The need to follow a diabetic diet has changed her normal meal schedule. Previously, she did not eat breakfast and ate meals at work when she had the time. "It is difficult now to remember to eat meals and snacks at the proper time". She is concerned because she is not losing weight fast enough. Subject No. 2 states that it is not difficult to follow the diet but finds she is particularly tempted to break it when she goes shopping. "I want to buy all the things I know I can't have." She has not contacted a dietitian since she has been at home. When visiting her doctor, the subject discussed weight loss and her concern about having too much food. He encouraged her to remain on the 1400 calorie diet as she requires adequate nutrients to combat the infection she is experiencing.

Urine Testing

Subject No. 2 tests her urine between four and five times a day. She was taught to test them four times a day, but if she thinks her blood sugar is high, she will test another specimen. She does not always use a double-voided specimen because of the inconvenience, but always does when testing the evening specimen. The results are recorded in her daily diary and shown to her physician when she visits him. The subject does not use urine tests to adjust her insulin. Instead, she tests her blood with a Dextrostix to provide a rough estimation of her blood sugar. This is done on the recommendation of her physician. She feels that it is a more reliable method and feels more secure in spite of the fact that it necessitates "poking a finger every time." Testing urines is not inconvenient. The only concern she expresses is to remember to test the urines at the correct time.

Footcare

Subject No. 2 does footcare daily as taught because "it's important to prevent skin breakdown and infection. The circulation is poorer in diabetics and they will have more difficulty healing." She notices the skin is very dry and uses lanolin ointment every day. The subject has had problems with her left foot since first coming to the hospital. Following the incision and drainage of the left toe, the site was very slow to heal. She was unaware that it was not healing normally. "Even though I was having pain, I saw the white tissue and thought that meant it was healing. I didn't know it meant that the skin was dead and the infection was spreading." Had she realized this, the subject says that she would have had it seen to much earlier and would hopefully have prevented re-hospitalization. She states she has "learned an important lesson." From now on, she plans to see a doctor immediately about any changes she notices with her skin.

Exercise

Prior to hospitalization, the subject was very active. She walked frequently and was "up and down all the time at work." Her activity level has decreased markedly. Due to her health problems she is unable to exercise regularly. "Exercise is something which should be done to maintain health." Her doctor recommended walking. She was told to begin slowly and gradually increase the amount. She now walks around the house and the garden when she feels up to it. She is very anxious to regain her strength so that she can go back to work.

Effects of the Disease

The subject feels that some of her symptoms have disappeared. She is no longer constantly thirsty and urinating frequently. She remains very fatigued but believes that this is a consequence of her other problems rather than diabetes. The subject strongly believes that if she had known about the consequences of diabetes and the importance of diet when she was first diagnosed three years ago, many of her current problems would never have developed. The major problem with diabetes is "establishing and maintaining a routine." The timing of meals and snacks and urine testing required some adjustment. A planned holiday had to be cancelled, but the subject attributed this to her general state of poor health rather than the fact that she has diabetes. She thinks that travelling with diabetes will not be a problem once she feels stronger. She has informed her family and friends about her diabetes. Her family have been very supportive. They were apprehensive at first, but have gained confidence and now assume responsibility by helping with injections and providing reminders to follow the routine. She found that some of her friends were "very surprised about what is involved with diabetes, and quite ignorant about the disease." The following statement demonstrates her current attitude about diabetes: "I try very hard to do what I am supposed to. It is very important to control the diabetes so that my other health problems will improve."

Reactions to the Education Experience

Subject No. 2 thinks that the classes she attended were "most helpful" in assisting her to learn about the disease. She also found that the explanations provided by her doctor and the research she did on her own have been very important in increasing her understanding of what diabetes is and what she must do for herself. Her physician has been especially helpful in instructing her on how to adjust her insulin dosages. She saw him twice while she was at home. She feels that the nursing staff were "extremely good" in instructing her and showing her how to care for herself. The diabetes teaching nurse has been very helpful. The subject contacted the nurse when concerns arose at home. The subject identifies the teaching nurse as the one individual most helpful in assisting her to care for herself. Dietitians were not seen as often as the nurses, but they provided practical information about the diet which the subject uses in preparing her meals. She states that she will have "no hesitation" in contacting either the doctor or the diabetes teaching nurse if concerns arise.

Subject No. 2 thinks that it is important that all diabetics undergo an education program. "It was very traumatic to find my diabetes so out of control. If I had realized the importance of proper care and the severity of the disease, I would have taken better care of myself. For example, I didn't always take my pills. I didn't think it was that important." The subject identifies a need for better public awareness. "Most people don't know much about diabetes. They treat you differently and ask you if you should be eating this or that. For their own sakes, they should know more. It could happen to them." She is adamant that all diabetics, even those controlled by diet alone, or by diet and pills, should be educated in the importance of following a diabetic routine. While she was at home, the subject tooks steps to further supplement her education. She and her husband visited the local Canadian Diabetes Association office, where she purchased a scale and two books about diabetes. She also purchased an Autolet kit which she uses when she does the Dextrostix procedure.

Summary

Although the subject displays a good understanding of the concepts of diabetes and the care it requires, she displays a lack of knowledge about some of the complications and factors associated with diet therapy. Her skills performances show a decrease in accuracy betweeen initial observation and follow-up observation in the areas of insulin administration and urine testing. These changes do not appear to be related to a lack of knowledge. For example, she knew that the urine tests should be timed accurately, but she didn't do it.

Within the limitations of her current state of health, the subject partially or completely complies with most aspects of her prescribed therapeutic regimen. She takes her insulin daily at the same time and rotates the injection sites. She carries out footcare daily. She tries to follow her diet but finds that nausea affects her appetite. In this instance, non-compliance is manifested by eating too little rather than too much. With the help of her family, the subject eats at the proper times and tests her urines according to the prescribed schedule. She exercises when she is able.

For this subject, a primary motivation is the belief that if she keeps her diabetes under good control, it will help to improve some of her other health problems. She is also concerned about the stress her illness is placing upon her husband. The assistance of her family is important in helping her to comply with her regimen. She is dealing with feelings of resentment that some of what she is experiencing could have been prevented. She is positive about the educational experience and feels that it has been very helpful. The subject believes that diabetes is "something that you have to cope with." However, she also feels that it is something that she will be able to manage successfully.

CASE STUDY NUMBER THREE

Personal Profile

Subject No. 3 is a seventy-three year old married female. She and her eighty year old husband live alone in their own home. They are retired. There are no children. The couple are very independent and manage all of their activities without assistance. The subject has a grade seven education. She was forced to leave school to care for her brothers and sisters upon the death of her mother. She occupies her time with activities around the house and with visiting and shopping with friends. The subject is currently very concerned about the health of her husband, who has been undergoing diagnostic tests for a heart ailment. She told the investigator "I haven't been doing much about my diabetes I'm more concerned about my husband at this point."

The subject has enjoyed very good health for most of her life. Her only pre-existing health problem is arthritis. She has pain and swelling of the joints, particularly in the hands and the feet. She is receiving medical treatment for this problem in the form of oral anti-inflammatory agents. She does not require any aids, such as a cane, at this time. The subject is also very hard of hearing and wears a hearing aid. Even with this device, she must supplement hearing with lip-reading. She is unable to understand what is being said if she cannot see the lips of the speaker.

Diagnosis and Education

Subject No. 3 visited her physician because she experienced swelling of her ankles. She was very concerned because she had a diabetic aunt who had lost both legs. The subject also experienced fatigue and increased thirst. She was given a physical examination and an oral glucose tolerance test. The glucose tolerance test showed that her blood sugars were elevated. She is not certain how high her blood sugars were but thinks they were "up around 400 mg." Her physician arranged for her to attend diabetic lectures at the hospital on an out-patient basis. She was to attend the lectures, receive a diabetic diet plan and diet counselling from the dietitians, and learn to test her urines. She was told to return to see her physician after she had completed the education program and had been following the diet for two weeks.

Due to vacations and staff shortages over the summer, the subject was unable to obtain an appointment with the dietitian until six weeks after she had finished the education program. This appointment was later cancelled by the dietary department and moved back another five weeks. As a consequence, the subject had still not been given a diabetic diet plan to follow nor had she received individual diet counselling at the time of the follow-up interview nine weeks later.

The subject attended the series of four classes during a single week. She attended the lectures alone. Her husband did not come with her as she felt it would be too tiring for him. The subject took some notes and asked questions concerning the diet and urine-testing procedure. She read the handouts provided in class. She experienced some difficulty in hearing what was being said. The slide-tape presentations presented particular problems as she could not hear the words clearly. The subject participated in learning activities such as testing a urine specimen. On the last day of class, subject No. 3 mentioned that she was looking forward to seeing the dietitian because she thought it would help her "to make more sense" out of what she had learned in the classes.

Knowledge Performance

The Pretest

It was not possible to pretest this subject before she had begun attending the diabetic classes. The subject recounted that she was glad to be attending classes because "I know nothing about diabetes." Her only previous contact with a diabetic individual was many years ago with a diabetic aunt. The subject knew that diabetes "had something to do with sugar." She expressed concern about being told she was diabetic because her aunt had both legs amputated. "It was very worrying - especially since my feet were beginning to swell."

The Posttest

The subject scored 30/42 on the posttest. The results were 16/20 on Part A and 14/22 on Part B. Areas where lack of knowledge or incorrect knowledge was demonstrated included questions concerning insulin, hyperglycemia and the interrelationships of various aspects of treatment such as balancing medications with increased exercise.

The Follow-up Posttest

The subject scored 25/42 on the follow-up posttest with 14/20 on Part A and 11/22 on Part B. Many of the same questions were answered incorrectly on the follow-up posttest. As well, five questions answered correctly on the initial posttest were answered incorrectly on the follow-up posttest. The subject obtained the same number of correct responses in the areas of characteristics of the disease and complications. However, in all areas concerning aspects of the therapeutic regimen, the subject's score decreased.

An analysis of the subject's responses on the posttest and follow-up posttest is presented in Table V.

Skills Performance

On the last day of class, Subject No. 3 demonstrated the urine testing procedure using the Ketodiastix method. She performed the procedure correctly and interpreted the results accurately. The subject was unable to demonstrate the footcare procedure due to lack of facilities, but outlined the correct procedure which she said she would follow at home.

Table V

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-up Posttest According to the Category of Question

Category of Question		Posttest			Follow-up Posttest		
		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of Disease	(12)	11	0	1	11	1	0
Medications	(5)	3	0	2	2	1	2
Diet	(8)	5	0	3	5	1	2
Footcare	(3)	2	0	1	1	0	2
Urine-Testing	(2)	2	0	0	1	0	1
Exercise	(2)	1	1	0	0	1	1
General	(3)	3	0	0	2	0	1
Complications	(7)	3	1	3	3	1	3
Totals	42	30	2	10	25	5	12

( ) Number of questions in each category

During the follow-up visit, the subject demonstrated the correct urine testing procedure using the Diastix method. She interpreted the results accurately. The subject described the procedure for footcare. While aware of the importance of wearing properly-fitting shoes, the subject said that she was not aware of the importance of checking the insides of her shoes periodically for rough edges. With the exception of this item, the subject described the procedure accurately.

Compliance with the Prescribed Therapeutic Regimen

Medication

The subject was not taking any medication to control her diabetes.

Reactions and Other Illnesses

Subject No. 3 has experienced "a few mild reactions." She says that she becomes very weak and shaky at times, especially when shopping. The subject finds that if she sits down and eats something such as crackers or cookies, she feels better. She always carries crackers in her handbag. So far, her husband has not been with her during a reaction. She has not seen her doctor or spoken to a health care worker about these episodes. With the exception of these attacks, she has noticed no change in the state of her health.

Diet

Subject No. 3 is not yet following a diabetic diet. Her eating habits have remained unchanged "except for cutting out sweets." She has not altered her methods of preparing foods or the amounts she eats. Special foods and sugar substitutes have not been purchased.

The subject says she realizes the importance of controlling her sugar intake but does not appear to understand what it means. For example, rather than using sugar substitutes such as sucaryl in her tea and in her baking, the subject uses demerara sugar. She has done this because a neighbour told her that this type of sugar was better for her. She does not realize that this form of sugar intake must be controlled as well.

The subject has found it difficult to follow the instructions given to her in class. She states: "I did try at first, but I didn't really understand. Lately I've been so worried about my husband, so I haven't really spent any time worrying about myself or trying to follow a diet." She has not spoken to her doctor or contacted a dietitian since attending the diabetic classes.

Urine Testing

The subject was told to test her urine three times a day but follows the procedure inconsistently. There are days when she does not test her urines at all. Some days she tests it once or twice and some days she does it three times a day as instructed. The number of times the procedure is done depends on the subject's daily schedule. If she is at home and it is convenient, she tests her urines at the specified times. She does not do it if she is busy and refuses to do it when she is out as it is "too inconvenient." The subject records the results of the tests in her daily diary. She wonders if it is worthwhile to do it all the time. "My urines are always negative no matter how much I eat. I'm not sure that there is much point in doing it all the time." Subject No. 3 states that she plans on showing the results of her urine tests to her doctor when she sees him.

Footcare

Although the subject recalls that she was told to do footcare daily, she states that she does it only "occasionally - maybe once a week, or sometimes twice." She realizes that it is important to do it to prevent infection but finds it "inconvenient to do it every day." She is always careful to wear properly-fitting shoes because of her arthritis. The subject has noticed no changes in the texture of her skin. She says that if she encountered problems such as a cut she would treat it "with an antiseptic - like iodine!" She does not recall being told to avoid treating foot lesions with strong antiseptic lotions.

Exercise

Subject No. 3 has not experienced a change in her level of activity since becoming diabetic. She is sedentary and does not exercise regularly. Her activities consist of housework and shopping. She does not garden or do yardwork. The subject does not remember being told about the importance of regular exercise in the diabetic classes. Her doctor did not discuss this topic with her. She states: "I can't do as much as I used to, but whether it's because of arthritis, diabetes or age, I don't know."

Effects of the Disease

Since becoming diabetic, Subject No. 3 has not noticed any real change in her life "except for testing urines and cutting down on sweets." For her, the major problem with diabetes is understanding the diet. "I know I should probably follow the diet but it's too complicated and I don't really understand it." Her thirst has subsided, as has the swelling in her ankles. She does not feel that diabetes has prevented her from doing what she wishes. While she has mentioned that she is diabetic to some of her friends, she neither wants nor expects assistance from them. "I want to take care of myself." The subject does not believe that the fact that she has diabetes has affected her husband in any way. When asked if she does things that she knows she probably shouldn't, Subject No. 3 responded: "I suppose I really should follow the diet. Maybe I will after I see the dietitian."

Reactions to the Education Experience

Subject No. 3 learned about diabetes and the care it involves from the lectures she attended at the hospital. She did not learn much about diabetes from her doctor, "only that it involves a problem with sugar." She hopes to receive more information and clarification from him when she goes to see him again. "The diabetes nurse educator was very helpful in showing me how to care for myself." This person is identified by the subject as the individual most helpful in showing her how to care for herself. The subject feels that she learned some information about diabetic diets from the dietitian, but recognizes that her understanding of this information is not very good. Suggestions for improvement include: "It would be helpful to know much more about the diet and how to use it at home." If questions or concerns about her condition arise, the subject plans to contact her physician. She stated that she was not aware that she could contact the nurse or dietitian at the hospital for further information. "It would be a good idea for me to have a review of the information. I've been thinking about seeing if I could take the classes again because I've forgotten so much of what they told me." The current attitude of the subject to being diabetic is expressed in the following statement: "It's not too bad. I would have liked to have known more about it sooner - especially about diet. I am more concerned about my husband now. When his problems settle down I'll think more about myself."

Summary

Subject No. 3 demonstrates a good understanding of the characteristics of diabetes. She is able to correctly answer the majority of questions in the other knowledge categories, but lack of understanding is evident in all aspects relating to self-care. Her knowledge level has declined by five points in the nine weeks between administration of the posttests. The subject's skills performance levels have remained unchanged. She is able to correctly test and interpret urine specimens and outline the correct procedure for footcare.

The subject does not completely comply with any aspect of her therapeutic regimen. Partial compliance is demonstrated in two areas. She does footcare and tests her urines but does both inconsistently. Convenience appears to be a major factor in determining how often these two procedures will be done.

Subject No. 3 has no recall of information relating to the importance of regular exercise. She has not changed her activity level in any way. She does not follow a diabetic diet. The subject has yet to receive individual diet counselling and a specific diet prescription. Lack of understanding about principles of diabetic diets and how to apply them is a major factor. The subject has tried to eliminate concentrated carbohydrates but as shown by her use of demerara sugar, does not understand carbohydrate sources. Another factor influencing her failure to follow the diet is her evident concern about the health of her husband. She mentioned him several times and obviously feels that his health is a priority at this time. The subject has not received any instruction or positive reinforcement from her physician. She has not yet seen him because she is waiting for her appointment with a dietitian.

The subject expresses a desire to do the right things for herself. She is very concerned about maintaining her independence and recognizes that her understanding of diabetes is not complete. Subject No. 3 hopes that the appointment with the dietitian and subsequent visit to her physician will help to supplement her knowledge. She is considering attending the classes again as a review.

CASE STUDY NUMBER FOUR

Personal Profile

Subject No. 4 is a sixty-one year old male who emigrated to Canada from the Phillipines in February 1981. He is married and has eight grown children. He and his wife live with a married son in an apartment in the city. The subject is fluent in oral and written English. The educational level achieved by the subject is a degree in law and some courses in psychology. Although he retired from government service in the Phillipines, the subject currently works as a security guard to supplement his income. The job involves working rotating shifts.

Subject No. 4 has always enjoyed good health. In his younger years, he trained for his country's Olympic gymnastic team. He states that this training "has helped me to say in shape and have good health." The subject was told in 1973 that he had "mild" diabetes. He was placed on oral hypoglycemic therapy. He does not know the name of the medication which was prescribed, but remembers being told to take one pill a day. Other instructions included to cut down on sweets and to avoid fats. He received no education about diabetes. A specific diabetic diet was not prescribed nor were urine testing, footcare or exercise routines.

Diagnosis and Education

Two weeks before the subject was admitted to hospital, he went to see a physician for a check-up. He was dizzy, short of breath, weak and sweaty. His blood sugar was 236 mg/dl. His physician placed him on one tablet of Diabenase twice a day. The subject was admitted to the hospital with severe abdominal pain. He was passing black stools and had lost five pounds. On admission, his blood sugar was 278 mg/dl. A gastroscopy was performed. It revealed that the subject had a bleeding duodenal ulcer. Treatment for the ulcer was instituted. At the same time, the decision was made to start the subject on insulin therapy to control his diabetes.

The subject was taught by the unit staff to do footcare and to test his urines using a double-voided specimen. The teaching checklist shows that he was able to perform these procedures correctly. Both the diabetes nurse educator and the nurses on the unit assisted the subject in learning to draw up and administer the insulin. The subject's wife was also taught how to give insulin injections. A 2,100 calorie C.D.A. diet was prescribed.

During the second week of hospitalization, after his medical condition had stabilized, the subject attended the series of diabetic lectures. He was accompanied by his wife. The subject appeared to listen attentively. Both he and his wife participated in activities such as urine testing. The subject did not take any notes during the classes, however his wife did. He stated that he reviewed the handouts. During the classes, he asked several questions concerning insulin, diet and urine testing. Individual diet counselling was given to the subject and his wife. The diet plan for a 2,000 calorie C.D.A. diet was reviewed as was a fluid diet for days of illness. Discharge instructions for the subject included: daily insulin injections of 30 units of N.P.H. insulin and 20 units of C.Z.I insulin; a 2,000 calorie C.D.A. diet; urine tests four times a day; and monthly blood sugar analyses.

The follow-up interview was held in the home of the investigator twelve weeks after the subject was discharged from the hospital.

Knowledge Performance

The Pretest

When first approached, the subject was hesitant about agreeing to participate in the study. He expressed concern about having a stranger visit his home. When told that other arrangements could be made, he then consented. As a consequence, the subject had commenced attending diabetic classes before a pretest of knowledge could be administerd.

Subject No. 4 stated that he was "pleased to be attending the classes because they have nothing like this in the Phillipines and I don't know much about diabetes." His only previous contact with a diabetic individual was with his mother. She had developed maturity-onset diabetes late in her life. The subject stated that he learned very little about diabetes and its treatment from her.

The Posttest

Subject No. 4 was given the posttest of knowledge on the day following completion of the diabetic classes. He scored 29/42 on the posttest with 16/20 on Part A and 13/22 on Part B. The subject was able to answer the true-false questions with ease, but experienced some difficulty with the more comprehensive questions contained in Part B. He incorrectly answered one-half of the questions concerning diet. The subject was unable to differentiate between the symptoms of hyperglycemia and hypoglycemia and incorrectly answered questions concerning the interrelationship between exercise, medication and food intake.

The Follow-up Posttest

The subject again scored 29/42 on the test of knowledge. This time he achieved 13/20 on Part A and 16/22 on Part B. He was able to correctly identify more characteristics of the disease and to more clearly differentiate between the symptoms of hyperglycemia and hypoglycemia. Incorrect responses decreased in the areas of diet, footcare and urine-testing. Although the total number of correct responses remained the same, the number of "Didn't Know" responses increased. Table VI contains an analysis of the subject's response on the posttest and follow-up posttest.

Table VI

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-up Posttest According to the Category of Question

		Posttest			Follow-up Posttest		
Category of Question		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of disease	(12)	9	1	2	11	1	0
Medications	(5)	3	2	0	3	0	2
Diet	(8)	4	4	0	3	4	1
Footcare	(3)	3	0	0	1	0	2
Urine-Testing	(2)	2	0	0	1	1	0
Exercise	(2)	2	0	0	2	0	0
General	(3)	2	1	0	2	1	0
Complications	(7)	4	2	1	6	1	0
Totals	42	29	10	3	29	8	5

( ) Number of questions in each category

Skills Performance

Observation of insulin preparation and administration, urine testing and footcare procedures was carried out on the day following the subject's completion of the diabetic classes. Subject No. 4 followed the correct procedure for preparing and administering the insulin injection. He palpated the injection site, but did not inspect it for atrophy as he was unaware of this step. He tested the urine specimen and interpreted it accurately using the Ketodiastix method. The correct procedure for footcare was outlined.

During the preparation of the insulin injection at the follow-up visit, the subject did not check the bottom of the N.P.H. insulin vial to ensure that no sediment remained when mixing the insulin. He reversed the order for injecting air into the two insulin vials. He drew up both insulins accurately, ensuring he had the correct number of units of each type. Aseptic technique was maintained throughout the process. When injecting the insulin, Subject No. 4 did not palpate the site or inspect it for atrophy. Upon completing the injection, he rubbed the site vigorously rather than applying pressure. He tested and interpreted the urine specimen accurately using the Diastix method. The footcare procedure was outlined correctly except that the subject was not aware of the need to periodically feel the insides of his shoes for the presence of rough edges.

Compliance with the Prescribed Therapeutic Regimen

Medication

Subject No. 4 is presently taking 30 units of N.P.H. insulin and 10 units of C.Z.I. insulin each morning. Several adjustments in his daily dose have been necessary because of fluctuations in the subject's blood sugar levels. The subject has his insulin regularly at 0700h. each morning. He states that his wife draws it up and he checks to make sure the dosage is correct. He then has his wife inject it. Only once since being at home has the subject injected the insulin himself. The sites are rotated daily in his legs, arms and buttocks. He refuses to use the abdomen as an injection site because "it scares me. I'm afraid I'll hit an organ."

The subject has not encountered difficulties in adapting to the need for a daily injection. "After a few days at home the routine was established." He does not feel that this aspect of his regimen has changed his life in a significant way except for adjusting the routine when working evening and night shifts. He is able to purchase all needed supplies and equipment at a neighborhood drugstore.

Reactions and Other Illnesses

The subject has experienced four insulin reactions. All have occurred while he was away from home. The time of occurrence varied. Two occurred in morning and two in the late afternoon. The subject is able to identify when a reaction occurs because he becomes cold, hungry, sweaty and shaky. He always carries a roll of Lifesavers in his pocket for use during an insulin reaction. He supplements the Lifesavers with food as soon as possible. The subject notified his physician after the first reaction. The doctor suggested decreasing the insulin dose. Since the first reaction, the subject has adjusted the insulin dosage by himself.

As the reactions have occurred outside the home, none of the subject's family have been present during a hypoglycemic episode. The subject states that his wife and son were very concerned at first. "They did not like the idea that reactions would occur." They were concerned for the subject's safety. "However, now that they see I can manage, they are becoming accustomed to it."

The subject has enjoyed good health since coming home from the hospital. He has not experienced any further abdominal pain. He takes oral antacids daily and feels that this has helped to prevent trouble with his ulcer. He has not noticed activities or emotions which affect his insulin needs.

Diet

Subject No. 4 believes that "diet is important to balance the sugar in the blood." He has been on the same 2,000 calorie C.D.A. diet since discharge from the hospital. The subject does not involve himself in the planning or preparation of meals. "That is my wife's job." They have purchased a scale and his wife utilizes the booklets received at the hospital. The subject's wife plans the meals one day at a time. As a guide, she uses the menus the subject received during his hospitalization. Subject No. 4 finds that following a diabetic diet is very economical. He has not noticed that food costs have increased. No special foods, such as sugar substitutes or water-packed fruits, have been purchased. He has found that a major change is the decreased amount of fresh fruits purchased. He now incorporates much less fresh fruit in his diet. The subject previously ate three meals a day. He seldom snacked. The major change in meal schedules is the inclusion of three snacks daily. The subject rarely eats out. When he does, he is very careful to follow his prescribed meal pattern. The same routine is followed on weekends as during the week. The subject finds: "It is not hard to stay on the diet. There are times when I would like to go off but my self-control is too strong." Neither the subject nor his wife have spoken to the doctor or dietitian about the diet. "My wife just follows what the dietitians told her."

Urine Testing

The subject was told to test his urine four times a day. He tests them before meals and "sometimes in the evening." A double-voided specimen is used "sometimes, but always the morning one." The subject records the results in his daily diary which he shows to his doctor at his monthly visit. He sometimes uses the results of his urine tests to adjust his insulin dose but more often adjusts his diet and exercise if his urines show increased sugar. The subject finds that there are times when he does not test his urine specimens while at work as it is "inconvenient." This happens once or twice a week.

Footcare

Subject No. 4 presents conflicting information about how often he performs footcare. He recalls that he was told to do it daily. While outlining the procedure, he stated that he did it "occasionally." When he was questioned later, he stated that he followed the procedure "every day." For him, footcare is important "because it helps prevent infection." He has not noticed any changes in the texture of his skin and finds that "scratches heal right away." The subject says that he would contact his doctor "right away" if he developed problems such as cuts which would not heal.

Exercise

Subject No. 4 believes strongly in the benefits of exercise. "It is very important because it helps to control blood sugars. You must balance food, insulin and exercise. Even in the hospital, I made sure I exercised by walking." The subject practices gymnastics regularly and goes for a walk once or twice a day. He notes that he "feels a difference" when he does not exercise, so he makes sure that he participates in some form of activity daily.

Effects of the Disease

The subject feels that diabetes and insulin-dependence has had a major impact on his life through "psychological changes."

He expresses his concerns: "It is a handicap when applying for a job. The disease doesn't bother me. I feel strong and my diet is okay. I feel really good - just like any other person but it has prevented me from getting some jobs I wanted. What really bothers me though is the change in sexuality. I have a reduced sex urge and decreased sensation. I don't know whether it's all in my head, or whether there is another cause. I've talked to some other men who say they have this problem." The subject has not discussed these concerns with either his wife or his physician. He is contemplating discussing these concerns with his doctor but says he feels "embarrassed" to discuss them with others.

The subject feels that his family has reacted well to the fact that he is now insulin-dependent. They worry about me, particularly when insulin reactions occur." He feels that they have adjusted to the changes. Travelling requires more careful planning, however the subject feels that he will be able to manage without difficulty. He says that he "tries very hard to follow what is to be done because I want to remain healthy."

Reactions to the Education Experience

Subject No. 4 believes that the diabetic classes were "very beneficial" in helping him to learn about diabetes and the care it requires. His physician provided some basic explanations about what diabetes is and the routine to be followed. He also provided explanations as to how to adjust the subject's insulin doses following a reaction. The subject has seen his doctor three times since discharge, when he has gone to have his blood sugars tested. The nurses emphasized the importance of punctuality and following the prescribed routine. They taught him how to draw up and inject insluin, how to do footcare and assisted him in "learning self-control, self-restraint and patience."The dietitians taught him "what kind of food to eat and how much to eat."

The subject was unable to identify one person who was most helpful to him. He found that his physician and the diabetes nurse educator were both very important in helping him to learn to care for himself. He says that he would have no hesitation in contacting either of these people to help him with questions or concerns. He asked the investigator how he could contact the diabetes nurse educator.

It is the opinion of the subject that the educational program should provide more emphasis on "teaching people how to adjust to the things they will experience at home." He feels that more attention should be paid to psychological adjustments such as how others might react. He would like to have learned more about how to adjust his own insulins. When asked how he now felt about being diabetic, the subject replied: "It is God-given. It's a challenge and a part of life. It doesn't bother me. In fact, it makes you realize your limitations and that you must conform to its requirements."

Summary

The performance of Subject No. 4 on the tests of knowledge reveals that he has a reasonable overall understanding of what diabetes is and what should be done. Areas where knowledge is lacking include medications, diet and footcare. Although the knowledge scores remained unchanged between the administration of the initial and follow-up posttests, he was able to answer more comprehensive questions correctly at the second testing. His skills performance levels for the footcare and urine testing procedures have remained unchanged. He is able to draw up and administer insulin safely in spite of some confusion about the order in which air is injected into the insulin vials.

The subject completely or partially complies with all aspects of his prescribed therapeutic regimen. In spite of the fact that he does not usually give his own daily insulin injection (he has his wife do it), he receives it daily at the correct time using a schedule for injection-site rotation. He will not permit injections in his abdomen.

The subject follows his prescribed diet and at present, his urines and blood sugar levels are within normal limits. He believes in the benefits of exercise and performs some activity daily. Partial compliance is manifested in his inconsistent performance of footcare. He does it at least once a week and sometimes more often. Urine tests are done three or four times a day, depending upon the convenience of performing this task.

The subject appears to have well-defined ideas about sex-role performance. He does not concern himself with the dietary aspects of the therapeutic regimen, but leaves this to his wife. His wife is successfully managing this aspect as evidenced by the subject's normal blood sugars and urine tests.

Subject No. 4 expresses concern about the psychological aspects of being an insulin-dependent diabetic. He feels that it has affected both his employment opportunities and his sexual performance. He is unsure of how to deal with these concerns. According to the subject, these concerns require further exposure in the education program. Subject No.4 displays an accepting attitude towards his illness. He feels that he is coping successfully with the disease and its prescribed therapuetic regimen.

CASE STUDY NUMBER FIVE

Personal Profile

Subject No. 5 is a forty-six year old female of French heritage. She is married and has four children. Her youngest child, a sixteen-year old daughter, lives with the subject and her husband. The couple own their own home which is located in a small town near Lesser Slave Lake. Although French is the subject's first language, she is fluent in oral English. She experiences difficulty in reading English and requires some assistance. The subject completed a grade five education before leaving school. She works full-time as an attendant at a day-care centre. She has no pre-existing health problems.

The follow-up interview was conducted in the subject's home eleven weeks after she had completed the education program.

Diagnosis and Education

The subject went to see her physician because of a recurrent vaginal yeast infection and the presence of carbuncles. She had experienced increased thirst over the previous three months and blurred vision for three to four months. She had also lost twenty pounds in the two months prior to visiting her doctor. Diagnostic blood tests revealed that her blood sugar level was 507 mg/dl. She was started on insulin therapy consisting of 16 units of C.Z.I. insulin and 20 units of Lente insulin daily. The subject was referred by her hometown physician to the metabolic centre for instruction and control of her diabetes. She attended the program at the centre six weeks after initial diagnosis. The subject was accompanied by her husband and daughter. The daughter attended the entire four days and the husband attended two full days and two half-days. Physical examination revealed that the subject was 30-35 Kg. over the ideal weight for her height. She also had a slightly elevated blood pressure. Her initial blood sugars were: fasting - 136 mg/dl.; 1100h - 230 mg/dl.; and 1500h - 206 mg/dl.

It was noted by the clinic staff that the subject appeared somewhat passive in accepting instructions during the first two days, but she gradually became more involved. Casual conversation with the subject revealed that she was apprehensive. "I didn't think I'd understand all that was said." She took notes during the presentations and participated in the learning activities. The subject had given insulin injections previously to her diabetic mother. The process was reviewed with her and she practiced under supervision. Both the daughter and her husband were shown how to draw up and inject insulin. The daughter gave the injection twice under the supervision of the nurse.

The subject attempted to complete the assignments given in class. She was able to complete the first meal plan assignment fairly well. Some problems were encountered in incorporating diabetic exchange recipes into the diet plan. The subject was unable to complete the quiz and the fluid diet assignments. She required only minimal assistance in the selection and weighing of foods. The subject displayed a positive attitude during the classes. Her husband and daughter were very supportive. They offered encouragement and assistance. For example, the daughter helped her mother to review some of the handouts.

On the third day of the program, the subject's blood sugars were: fasting - 123 mg/dl.; 1100h - 169 mg/dl.; and 1500h - 144 mg/dl. She was discharged on a daily insulin dosage of 18 units of C.Z.I. and 22 units of Lente. Her diet prescription was a 1,440 calorie C.D.A. diet containing 76 gm of protein, 195 gm of carbohydrate and 45 gm of fat. (Dietary instruction at the metabolic centre reflects a greater emphasis on the amounts of protein, carbohydrate and fat intake than on exact calorie intake.) The subject was instructed to test her urines daily, and to do a weekly Dextrostix. She was encouraged to adhere to her dietary weight-reducing program. The subject purchased a weigh-scale and books about diet and exercise from the metabolic centre. Before returning to their hometown, the family went to the Canadian Diabetes Association office to purchase supplies.

Knowledge Performance

The Pretest

Part A. Subject No. 5 responded to the question about what diabetes meant to her in terms of her emotional reactions. "I was scared and nervous. I didn't want to accept it. It meant I would have to make changes in how I live my life." Subject No.5's mother had diabetes for many years and the subject was required to give her mother daily insulin injections and test her urines. The subject had learned some basic information about the disease. She knew it was "a problem with sugar." Subject No. 5 was concerned because she had not liked giving injections to her mother and was not looking forward to giving them to herself every day.

Part B. The subject scored 14/20 on the true-false questions. An analysis of responses shows that the subject was able to answer the majority of questions correctly in all of the categories of questions, but she had incorrect or deficient knowledge in all areas except for exercise. The results of this analysis are presented in Table VII.

Table VII

Frequency Distribution of 'Right', 'Wrong' and 'Didn't Know' Answers on Part B of the Knowledge Pretest According to Category of Question

Category of Question		Right	Wrong	Didn't Know
Characteristics of Disease	(5)	3	1	1
Medications	(4)	3	0	1
Diet	(3)	3	0	0
Footcare	(3)	2	0	1
Urine Testing	(2)	1	1	0
Exercise	(1)	1	0	0
General	(2)	1	0	1
Total	20	14	2	4

Table VIII

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-up Posttest According to the Category of Question

		Posttest			Follow-up Posttest		
Category of Question		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of disease	(12)	12	0	0	11	1	0
Medications	(5)	4	0	1	4	0	1
Diet	(8)	6	2	0	5	1	2
Footcare	(3)	3	0	0	2	0	1
Urine-Testing	(2)	2	0	0	2	0	0
Exercise	(2)	2	0	0	1	0	1
General	(3)	3	0	0	2	1	0
Complications	(7)	3	1	3	5	1	1
Totals	42	35	3	4	32	4	6

( ) Number of questions in each category

The Posttest

Subject No. 5 achieved 35/42 on the posttest. Her score was 19/20 on Part A and 16/22 on Part B. She correctly answered all the questions concerning characteristics of the disease, footcare, urine testing, exercise and general care. She incorrectly answered two questions about the principles of diabetic diets. She was unable to differentiate between the symptoms of hyperglycemia and hypoglycemia and did not know the correct answer to a question concerning the balance between activity and medication.

The Follow-up Posttest

The subject scored 32/42 on the follow-up posttest, with 17/20 on Part A and 15/22 on Part B. The number of correct responses decreased in the areas of characteristics of the disease, diet, footcare and general health principles. Her ability to differentiate the symptoms of hyperglycemia and hypoglycemia increased. An analysis of the subject's responses to questions on the posttest and follow-up posttest is presented in Table VIII.

Skills Performance

Subject No. 5 was observed performing the skills on the last day of classes before she and her family left for home. When drawing up the insulin, the subject experienced difficulty in seeing the markings. She was unsure that she had the correct amount and asked for confirmation. Initial confusion was experienced over the dosages of the two insulins. She almost contaminated the needle by placing the syringe on the table without protection, but stopped before contamination occurred. She injected the insulin correctly. The subject tested her urine correctly using the Ketodiastix method and interpreted the results accurately. She outlined the procedure for footcare and mentioned that the importance of proper footwear had been emphasized by both the doctor and the nurse. The subject recounted that she had been told that the plastic shoes she was wearing were not the proper kind of footwear for a diabetic person.

At the follow-up visit, the subject drew up the insulin according to the procedure taught at the metabolic centre. She drew up the correct amount accurately and confidently. She was able to see the unit markings clearly. She injected the insulin according to the procedure learned at the centre. The urine specimen was tested using the Diastix method and the results were interpreted accurately. When outlining the procedure for footcare, the subject failed to mention cutting her toenails. When asked, she was able to identify the correct way to cut her toenails. The subject stated that she frequently went barefoot even though she had been told not to.

Compliance with the Prescribed Therapeutic Regimen

Medication

Subject No.5 is presently taking 16 units of C.Z.I. insulin and 20 units of Lente insulin every morning. Upon discharge from the centre, she was taking 18 units of C.Z.I. insulin and 22 units of Lente insulin daily. The adjustment in her insulin dosage was required because she experienced hypoglycemic reactions while at work. The subject takes her insulin each morning at 0600h. She usually gives it herself, but will ask her daughter to do it if she cannot reach an injection site. She rotates the sites for injection using a clock-wise schedule. At first, the subject found that it took approximately one-half hour to do the procedure. She partly attributes this to being "scared." She didn't like injecting herself and was afraid of making a mistake in the dosage because of her blurred vision. Since her vision has stabilized and her confidence has increased with practice, she has experienced no difficulty with this aspect of care. The subject now finds that it takes her "only a few minutes to get the injection ready and give it." The subject purchased all of her supplies in the city before coming home. Since then, she has checked with her local drugstore and finds they carry all the supplies that she needs.

Reactions and Other Illnesses

Subject No. 5 has experienced four insulin reactions. All have occurred while she was at work. Two reactions occurred in the morning and two in the afternoon. She can identify the onset of an insulin reaction. "I get shaky and sweaty and hungry." On one occasion, her director noticed that she was very pale as the reaction started. She treats the reactions by eating some form of food, usually cookies or Lifesavers. She carries Lifesavers with her at all times. After the first reaction, the subject telephoned her physician After the second reaction, she visited the doctor and had blood sugar tests done. Based on the results of the blood tests, the doctor decreased her insulin dose to its present level. The doctor told the subject that the adjustment was needed because of the weight she had lost. The subject believes that the two afternoon reactions occurred because she did not eat her snacks on time. She now makes an effort to eat all her meals and snacks at the designated times.

All the reactions have occurred while the subject was at work. No member of her family has been with her during a reaction. They know what to look for and what to do. The subject feels that "they'll be able to handle it okay."

The subject has been in good health since becoming diabetic. Two weeks before the follow-up visit, she required minor gynecological surgery. Following surgery her blood sugar levels increased. It required an increased insulin dosage for two days to bring the blood sugar levels back down. This is the only time that the subject required an increased amount of insulin.

Diet

Subject No. 5 knows that following her diet is important "to control the sugar and to help me lose weight." The subject follows her diet for six days and then allows herself some favorite foods one day a week. "It's very hard to follow it all the time. Sometimes I just have to eat more. It seems that once a week I have to eat what I want. If I can do that, then I can follow it the rest of the time."

She found that it was especially hard during the first two weeks as she was constantly hungry and thinking about food. It is easier for her now that she knows there is one day that she can have foods that she likes. The subject is careful "not to go overboard" on the day that she does not follow her diet. The subject has lost thirty pounds in the eleven weeks since completing the education program, She is encouraged by the weight loss and finds that it helps her to follow the diet.

Subject No. 5 plans and cooks her meals one day at a time. She initially weighed her foods but no longer does so. "I can tell how much food I'm supposed to have. I use the scales when I'm not sure." She finds that food costs have not changed. The only special foods purchased are artificial sweetener and diet pop. The subject is careful to order food which fits to her diet plan when she eats out.

The subject used to eat three meals a day and snack whenever she was hungry. She now eats three meals and three snacks at regular times. The cook at the day-care centre where she works prepares a measured diabetic lunch for her, and she brings her snack from home. There is little change in routine on weekends. It is usually one of these days that the subject picks to "treat" herself. She has not contacted a dietitian. She was going to telephone one day but decided "that it was too much bother." The subject has discussed her diet with her physician. He has been very encouraging about her weight loss. She discussed increasing her diet when she experienced the insulin reactions but the doctor decided that adjusting the insulin dosage was a more appropriate measure.

Urine Testing

The subject tests her urine once a day in the early morning. She was instructed to do so by her local physician as her urine tests are usually negative. She uses a double-voided specimen. The results are recorded in her daily diary and shown to the doctor. The subject does not use the results to adjust her insulin. This is done by her physician and is based on the results of her blood tests.

Footcare

Subject No. 5 does not do footcare consistently. She soaks her feet when she has a bath "about once a week." She does not apply ointment or cut her toenails as instructed. The subject frequently goes barefoot and continues to wear plastic shoes. "I don't like shoes. If I have to wear them, this pair is at least comfortable." The subject knows that it is important to prevent cuts and infections in the feet. She says that she will see her doctor at once if she has any problems such as cuts.

Exercise

The subject's level of activity has not changed since becoming diabetic. She does not exercise regularly. She takes occasional walks, gardens and does housework. "I run around a lot at work. I'm always chasing after the kids. She does not recall what she was told about exercise when at the metabolic centre. She has not discussed exercise with her doctor. The two reasons given for not exercising regularly are "finding the time and finding something that I like to do."

Effect of the Disease

The subject identifies having to follow a diet and having to give a daily insulin injection as the two major changes that diabetes has made in her life. Although the subject finds that giving herself an injection bothers her once in a while, she identifies the major problem with being diabetic as the comments of other people. "People encourage you to eat. They don't understand that you are trying to follow a diet. They also say things that upset me. A couple of people told me that they knew someone who died from sugar diabetes. It really worried me so I talked to my doctor. He told me to ignore them." Her friends and relatives are "relieved to know that the problem has been discovered." Her family is very supportive in helping with injections and reminding her to eat on time.

Reactions to the Education Program

Subject No. 5 found the four days spent at the metabolic centre very important in helping her to understand diabetes. "It was really great. They taught me so much. I knew some things because of my mother, but they helped me to understand what it is and how to take care of myself. I was scared at first but by the end of the week I was pretty sure of everything." The subject is unable to differentiate among the personnel at the centre. She feels they were all helpful.

The subject's physician is the person she identifies as helping her most in learning to care for herself. "He's really great. I see him once a month and if I have any problems I can call him and talk. He doesn't put me off. He's been really great about helping me and answering questions. He told me all about diabetes, insulin and diet."

Subject No. 5 has no recommendations for improving the educational program or suggestions for information to be included.

Summary

The subject displays basic understanding of the characteristics of diabetes and the care it requires. There is some lack of knowledge in all categories related to following the prescribed regimen. The subject does not apply all of her learning to her care. For example, she knows that she should not walk barefoot but continues to do so. She shows an increased accuracy and confidence in the preparation and administration of daily insulin injections and tests her urines correctly as instructed. The subject's recall of the footcare procedures reveals decreased understanding of the procedure. This decreased understanding may be related to the fact that she does not perform the procedure regularly.

Subject No. 5 completely or partially complies with most aspects of her prescribed therapeutic regimen. She takes her insulin daily at the same time, using a site-rotation schedule. Her urines are tested once a day as instructed. She tries to follow her diet and does so for six days a week. Her solution to the problem of following a restrictive diet appears to be successful for her. Her blood sugars remain within normal limits. She has been successful in losing weight. The subject does do footcare, but not on a regular basis. She soaks her feet when she has a bath but she does not inspect them daily or cut her toenails as instructed. She continues to walk barefoot and to wear shoes which are not healthy. Comfort and convenience appear to be the reasons for lack of compliance with this aspect of care.

The subject does not exercise regularly. She does not recall what she was told, and seems to believe that she receives sufficient exercise in the performance of her daily activities. Unless the subject is convinced that regular exercise will help her to maintain her health and lose weight, it is doubtful that she will incorporate an exercise program into her daily routine.

Subject No. 5 has no suggestions for improving the educational program. She is very positive about the experience, feeling she has learned much and gained confidence in her ability to care for herself.

The subject is determined to "stay healthy." Her initial reaction of fear, based mainly on what she learned about diabetes while caring for her mother, has subsided. She states: "I feel good. I think -- no, I know that I can manage this."

CASE STUDY NUMBER SIX

Personal Profile

Subject No. 6 is a thirty-one year old male. He is married and has a three-month old daughter. The family lives in a rented house just outside the city. The subject is employed full-time as a heavy-duty mechanic. He emigrated to Canada about five years ago. Although Dutch is his first language, he is fluent in both oral and written English. His educational background consists of high school and technical training. The subject's wife worked prior to the birth of the child, however she now stays home to care for the baby.

The follow-up interview was conducted in the subject's home six weeks after completing the education program. The subject's wife was present during the interview.

Diagnosis and Education

The subject, who has always enjoyed good health, went to see a physician because he was very tired, lacking energy, constantly thirsty and frequently going to the bathroom. Diagnostic blood tests revealed that the subject had Diabetes Mellitus. He was started on insulin therapy and referred to the metabolic center for education and control of his diabetes. There was a one-week period between the time of diagnosis and the time the subject attended the program at the metabolic center. During that week, Subject No. 6 would get up one hour early and drive to a hospital. There he would be given his insulin injection on an out-patient basis.

On admission to the metabolic center, the subject's blood sugars were: fasting - 248 mg/dl.; 1100h - 371 mg/dl.; and 1500h - 229 mg/dl. He was taking 22 units of C.Z.I. insulin and 34 units of Lente insulin daily. Physical examination revealed that the subject was 5 Kg. over his ideal weight. He had slight muscle-wasting but showed no evidence of diabetic neuropathy. It was noted that the subject was color-blind.

Subject No. 6 was accompanied to the metabolic center by his wife. Both actively participated in all learning activities. Each was taught how to draw up and administer insulin, do urine tests and do Dextrostix blood sugar determinations. The subject's wife checked the results of the urine tests and Dextrostix procedures as the subject is color-blind and cannot easily differentiate the colors on the reagent strips. She planned to continue checking the results at home.

Both the subject and his wife completed all assignments. The written diet assignments were done well. The couple worked together to complete them. The subject was able to select and weigh foods appropriate to his diet plan. Assignments on other aspects of care were also done well. Both the subject and his wife were able to follow rules for adjusting insulin doses and apply them correctly. The couple asked appropriate questions in class and in individual counselling sessions. They were able to readily apply information learned in class. For example, one night the subject experienced an insulin reaction at 0200h. It was detected and treated appropriately. The subject's wife was actively involved in all phases of the program. She was extremely supportive of her husband.

During the week, the subject's insulin dose was altered. Due to the fact that the subject had a long working day, the decision was made to place him on a mixture of three types of insulin. He and his wife were supervised in the preparation and administration of the new mixture of insulins.

At the time of completing the education program the subject's blood sugars were: fasting - 114 mg/dl.; 1100h - 200 mg/dl.; and 1500h - 134 mg/dl. He was receiving 20 units of Semilente insulin, 20 units of Lente insulin and 4 units of Ultralente insulin He was instructed to follow a 2,233 calorie C.D.A. diet containing 101 gm of protein, 360 gm of carbohydrate and 45 gm of fat. He was to test his urines four times a day. Blood sugars were to be tested once a week for one month and then at monthly intervals. The couple purchased a scale and some books about diabetes before leaving the metabolic center.

Knowledge Performance

The Pretest

Part A. Subject No. 6 responded to the question asking him to describe what diabetes meant to him in relation to its impact on his life. "Diabetes is something I have to live with for the rest of my life. This is going to change my lifestyle but I believe I can live with this. There are some worse things in life."

Part B. The subject scored 8/20 on the true-false questions. While the subject was familiar with a few of the characteristics of the disease and some aspects of treatment, his knowledge was incorrect or deficient in all categories of questions. An analysis of the subject's responses to Part B of the pretest is presented in Table IX.

The Posttest

The subject scored 39/42 on the posttest. The results were 20/20 on Part A and 19/22 on Part B. Of the three incorrect responses, two involved choices in diet and one concerned general health practices.

The Follow-up Posttest

The subject's knowledge level remained consistently high over the six week period between administrations of the posttest. He again scored 39/42 on the follow-up posttest with 19/20 on Part A and 20/22 on Part B. Only one question, concerning choices in diet, was answered incorrectly on both tests. On this test, the subject did not correctly identify that insulin could be given only by injection, and incorrectly answered a question concerning the effect of increased exercise on a person's blood sugar. An analysis of responses to the two administrations of the posttest is presented in Table X.

Skills Performance

On the concluding day of the program, the subject demonstrated the preparation and administration of insulin and the urine testing procedure. It was the first day that the subject was required to draw up three kinds of insulin. Initial confusion was experienced over the order that the insulins should be drawn up. He had some difficulty in removing

Table IX

Frequency Distribution of 'Right', 'Wrong', and 'Didn't Know' Answers on Part B of the Knowledge Pretest According to Category of Question

Category of Question		Right	Wrong	Didn't Know
Characteristics of Disease	(5)	3	0	2
Medications	(4)	0	1	3
Diet	(3)	2	0	1
Footcare	(3)	0	0	3
Urine Testing	(2)	1	0	1
Exercise	(1)	1	0	0
General	(2)	1	0	1
Total	20	8	1	11

Table X

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-up Posttest According to the Category of Question

		Posttest			Follow-up Posttest		
Category of Question		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of disease	(12)	12	0	0	12	0	0
Medications	(5)	5	0	0	4	1	0
Diet	(8)	6	1	1	7	1	0
Footcare	(3)	3	0	0	3	0	0
Urine-Testing	(2)	2	0	0	2	0	0
Exercise	(2)	2	0	0	1	1	1
General	(3)	2	1	0	3	0	0
Complications	(7)	7	0	0	7	0	0
Totals	42	39	2	1	39	3	0

( ) Number of questions in each category

an air bubble, but did so without contaminating the equipment. He injected the insulin into his abdomen using the correct technique. The subject and his wife tested the urine specimen together using Chemstrip equipment. This type of testing equipment was utilized because the subject was able to more clearly differentiate the colors on the Chemstrip reagent strips. The procedure was followed correctly and both the subject and his wife were able to interpret the results accurately. The subject outlined the correct procedure for footcare. He planned to perform this procedure reguarly at home.

During the follow-up visit, the subject performed all of the procedures correctly. He drew up his insulins accurately and confidently. The urine test was performed and interpreted accurately. Diastix equipment was used. The subject stated that he used this equipment instead of Chemstrip because his urines were always negative and he could "easily read the negative result with Diastix." The procedure for footcare was outlined as taught.

Compliance with the Prescribed Therapeutic Regimen

Medication

Subject No. 6 is presently in a state of remission and his insulin needs have decreased markedly. At the completion of the education program, the subject was taking 20 units of Semilente insulin, 20 units of Lente insulin and 4 units of Ultralente insulin. He is now taking 4 units of Semilente insulin, 2 units of Lente insulin and 2 units of Ultralente insulin. The subject initially telephoned his physician daily for his insulin dosage. The decreased dosage was based on the results of his urine tests and blood sugar analyses. The subject states that he now has enough confidence to adjust his insulin dosage by himself and contacts his physician only if unsure of what to do.

The subject takes his injection daily at 0700h. He keeps all of his equipment in a container in a kitchen cupboard where it is readily accessible. He rotates his sites for injection daily using a clock-wise schedule. His wife gives him the injections when he uses sites, such as the back and the buttocks, which he cannot easily reach. The subject is able to obtain all of the required equipment at a drugstore close to his place of employment. His initial reaction to daily injections was a lack of confidence. He felt "unsure" at first, and found that it took him about twenty minutes to prepare and give the injection. He now feels confident in performing this procedure. Other than "getting up a few minutes earlier than I used to," the subject does not feel that the necessity of a daily insulin injection has changed his normal routine. He has not noticed any specific activity or emotion which makes his insulin needs change.

Reactions and Other Illnesses

Subject No. 6 has had insulin reactions "once in a while when meals or snacks have been delayed." He is able to recognize when a reaction is occurring because he becomes weak, hungry and shaky. His wife notices that he becomes very pale. Reactions are treated by "taking something sweet at once." The subject is prepared for the possibility of insulin reactions. "I always carry sugar with me and I have a food supply in my car."

After insulin reactions have occurred, the subject has reduced his insulin dosage according to the principle learned in class. He notified his physician after the first reactions. The physician recommended weekly blood tests and a decrease in the daily insulin dosage. The subject's wife has been with him during two reactions. She is able to recognize the occurrence of a reaction and to treat it. She accepts insulin reactions as part of the disease. The subject's health has been excellent. He has lost ten pounds over the past six weeks and feels "really good."

Diet

Subject No. 6 follows his diet plan very carefully. "It is important to control my blood sugar levels." He continues to follow the diet given to him at the metabolic center. Meal planning and preparation is carried out by the subject's wife. She plans the menus several days in advance. The couple own a freezer and a microwave oven. The subject's wife prepares several meals at one time, measuring and weighing the correct amounts of foods. The meals are then frozen and heated in the microwave oven when ready to be eaten.

Since the subject began following a diabetic diet, his wife has noticed a difference in food shopping. They now purchase more fruits and less protein foods than previously. They notice that the costs have increased somewhat, but feel that it is not an unmanageable increase.

The subject has noticed a difference in his scheduling of meals. He always ate three meals a day but must now remember to include three snacks. On weekends, the subject must now get up for his injection whereas previously he could sleep in on those mornings. The subject does not eat out in restaurants. At social gatherings he finds it difficult. "People offer me things I can't have. I would rather eat in private and go away until everyone is finished. It's much easier that way.

The subject finds that the rigidity of the diet is the major difficulty in following a diabetic diet. "You must eat a certain amount at a certain time. It's also time-consuming. Everything must be carefully planned." The subject complies with his prescribed diet plan. "I follow it very closely. I miss some foods, but it's important to stick with it. I'm sometimes delayed a bit - like when I'm at work, but I don't eat extra amounts." Neither the subject nor his wife have contacted a dietitian for assistance with the diet. The subject has spoken to his physician about the diet. The physician is considering increasing the subject's food intake as he has now attained his ideal weight.

Urine Testing

Subject No. 6 tests his urines four times a day as instructed. He does not use a double-voided specimen "because the results are always negative." The results of the tests are recorded in his daily diary, and are reported to the physician when the subject phones the doctor for adjustments in the insulin dosages. He also uses the results to adjust his own insulin based on the principles he learned in the classes. Subject No. 6 does not find that testing his urines regularily creates any difficulties for him. "It's no problem. I take the Diastix with me. There's a washroom handy at work."

Foot Care

Subject No. 6 has not noticed any problems with his feet or skin. He occasionally experiences cuts and scratches in his hands while at work but finds that they heal quickly. The subject recognizes that it is important to take care of his feet to "prevent infection." He bathes and inspects his feet daily. He does nailcare as instructed but does not apply lotion as he feels that it is unnecessary. He has not experienced any problems with his feet but would seek assistance "at once" if difficulties developed.

Exercise

Subject No. 6 believes that "exercise is necessary for good health." He recalls that both the doctor and the nurse at the metabolic center recommended exercising for twenty minutes daily. Prior to becoming diabetic, the subject did not exercise regularly. He now undertakes some form of activity every day. While at work, he walks for at least twenty minutes during his lunch break. On weekends, he makes a point of participating in some form of activity. The time spent depends on the nature of the exercise. The need for regular exercise has not created any difficulties for the subject and he has readily incorporated this aspect of care into his daily routine.

Effects of the Disease

Subject No. 6 feels much better now than when he was initially diagnosed. His symptoms have disappeared and he has much more energy. He sees the adjustment required in his daily routine as the major problem with being diabetic. "You have to follow a diet, take insulin and test your urines at certain times. Getting a routine established took time but now it's working fine." Being diabetic has not prevented him from doing what he wishes "except for eating certain foods and having a snack when I want one."

The subject has told his relatives, friends and co-workers that he is diabetic. They have reacted positively. His mother, who lives in Holland, was initially "very concerned" about the fact that he has diabetes. "Now that she knows I'm doing well, she feels better about it." The subject does not do things that he knows he shouldn't. "I try very hard to follow the routine. I want to stay healthy. It's important to my family and to me." He expressed concern about the effects of diabetes on his family. He wonders about the possibility of his daughter developing diabetes in the future amd the effects of the disease on other children he may have.

Reactions to the Education Experience

Subject No. 6 and his wife found the four days spent at the metabolic center "very helpful" in learning about diabetes and the care it requires. He received some simple explanations about diabetes from his doctor when first told that he was diabetic. These explanations were expanded while he was at the center. The subject has spoken to his doctor several times on the telephone and plans to make an appointment to visit him "within the next few weeks." The nurse at the center taught the subject how to manage the daily routine. "She taught us about insulin and injections, urine tests, how to do a Dextrostix, and showed us how to manage day-to-day." The couple found the information presented by the dietitians was useful in helping them to plan meals at home. "The diet assignment with the recipe book helped us to understand the diet, but we'd never use it. It would be better to do diets that we could use."

Both the subject and his wife believe that the program should include a section which deals with the emotional aspects of being diabetic. "It would have been helpful to have someone who has the disease discuss the problems in adjusting." They also express concern about the amount of information presented. "The classes are very rigid. People are saying you must do this and you must do that. On the first day of classes, we were very depressed and discouraged. It was just too much. It seemed as though you couldn't get away. Perhaps at least, there should be a longer lunch break - to get away for a while. There is just so much to absorb."

The subject identifies his wife as the person most helpful in assisting him to learn about diabetes. He thinks that the nurse was "very helpful and very understanding." The subject says that he would have no hesitation in contacting the doctor if major concerns arise. He is planning on attending the clinic soon for one day "to review what I have learned."

Summary

The subject displays a very good understanding of what diabetes is and the care it requires. His level of knowledge has remained consistently high. Skills performance show continued accuracy and increased confidence between initial and follow-up observations.

The subject complies with all aspects of his prescribed therapeutic regimen. He completely complies with insulin administration, urine testing, exercise and diet. He does not follow the footcare procedure exactly as taught, but incorporates the essential elements of daily hygiene and inspection.

For this subject, the maintenance of good health appears to be a primary motivation. His life, outside work, centers around his wife and his child. He wants to enjoy his family. The subject's wife is very supportive and is actively involved in helping him to follow his prescribed therapeutic regimen. Both the subject and his wife are positive about the helpfulness of the education experience. More information about the emotional aspect of diabetes and a change in the timing of classes and breaks are suggested as two changes which would improve the education experience.

CASE STUDY NUMBER SEVEN

Personal Profile

Subject No. 7 is a fifty-one year old married female with eight children. All but one child, a teenage daughter, live away from home. The subject, her husband and daughter live in their own home which is in a small town located thirty miles from Edmonton. The subject had been working full-time in a hotel but is now at home. She completed grade eight before leaving school.

The subject has had some health problems in the past. As a child, she was hospitalized with rheumatic fever. She states that she has had periods when she had been very tired and not able to accomplish anything. Her chart states that she was diagnosed as being diabetic in June, 1979. The subject states that she is a new diabetic as of June

1981. She states that she has never previously received any treatment or education for diabetes.

The follow-up visit was conducted in the subject's home six weeks after she completed the four-day education program at the metabolic centre. Only the subject and the investigator were present.

Diagnosis and Education

Subject No. 7 was referred to the metabolic centre for instruction and control of her diabetes after an oral glucose tolerance test, ordered by her local physician, revealed markedly elevated blood sugars. Her recent medical history included recurrent yeast infections, fatigue, blurring of vision and headaches. On admission to the metabolic centre, the subject's blood sugars were: fasting - 231 mg/dl.; 1000 h. - 265 mg/dl.; and 1400 h. - 237 mg/dl. Her medical history revealed that four of her children weighed over nine pounds at birth. She had been experiencing nocturnal leg cramps for two to three years, a "terrible" appetite and parathesias of the feet. Physical examination showed that the subject was forty kg. over her ideal weight. She had moderate muscle wasting and some tenderness of her limbs. There was no sensory loss. The skin on her feet was very rough and cracked.

The subject was taught how to test her urines and do Dextrostix blood glucose determinations. On the second day of the program, she was placed on oral hypoglycemic therapy (Chlorpropamide 500 mg. daily) to control her blood sugars. The actions and effects of the oral hypoglycemic medication were reviewed with her as were the instructions for daily administration. There was a distinct possibility that the subject would require daily insulin injections in the future if she did not follow her diet and lose weight. To prepare her for this possibility, the subject was given instructions about how to prepare and administer insulin injections. The nurse supervised her in this procedure and the subject gave herself an injection in her abdomen. The subject was aware that her weight aggravated her condition. She expressed a desire to lose weight so that insulin injections would not be necessary.

The subject was accompanied by her husband for the four days of the program. She was quiet and appeared somewhat withdrawn on the first day, but participated in learning activities. Her written diet assignments were done well. She was able to plan her meals and make appropriate food choices as well as select and measure foods which fit her diet plan. In other assignments, the subject displayed some difficulty in identifying the symptoms of acidosis and was not able to apply the rules for adjusting insulin doses well. The subject's husband was very quiet. He participated in some of the activities but did not complete all of the assignments. He was very supportive of the subject's determination to lose weight and said that he would like to lose weight with her. The subject's confidence increased during the week. She spoke out and asked appropriate questions in the classes and in individual counselling sessions.

At the completion of the education program, the subject's blood sugars were: fasting - 231 mg/dl.; 1000 h. - 174 mg/dl.; and 1400 h. - 170 mg/dl. The subject was instructed to follow a 1,682 calorie C.D.A. diet containing 85 gm. of protein, 223 gm. of carbohydrate and 50 gm. of fat. She was to take 500 mg. of Chlorpropamide daily, test her urines four times a day, do daily footcare, and have weekly blood sugar tests. The importance of adhering to her weight-reducing diet was emphasized. She was instructed to return to the centre in one month for a review and a progress check. While at the centre, Subject No. 7 purchased a food scale and books about diabetes and exercise.

Knowledge Performance

The Pretest

Part A. The subject's response to the question asking what diabetes meant to her included: "It means a lifetime of diet that will probably make me feel much better. So far, it has meant that I don't feel good but I'm a new diabetic." The subject identified two diabetic people with whom she had previous contact. From a friend the subject learned: "That cheating on her diet made her worse. That she must learn to follow her diet more closely." The subject also had a brother with diabetes. "He died when I was very young so I don't remember much except that he had diabetes."

Part B. Subject No. 7 scored 11/20 on the true-false questions. She correctly answered all of the questions about diet and general health practices. She was able to correctly answer some questions in all other categories with the exception of footcare. An analysis of the subject's responses to the questions on Part B of the pretest is presented in Table XI.

The Posttest

The subject scored 34/42 on the posttest with 16/20 on Part A and 18/22 on Part B. She correctly answered all of the questions concerning characteristics of the disease, footcare, urine testing, exercise and general health practices. She displayed some confusion with questions concerning medications and was unable to correctly answer some questions about diet. While able to identify the symptoms and treatment for hypoglycemia, she was unable to identify any symptoms of hyperglycemia.

The Follow-Up Posttest

The subject's level of knowledge showed a two-point increase on the follow-up posttest. She achieved a score of 36/42 with 18/20 on Part A and 18/22 on Part B. On this test, the subject was able to make a correct choice on a question about diet and was also able to identify some of the symptoms of hyperglycemia. An analysis of the subject's responses to the two administrations of the posttest is presented in Table XII.

Skills Performance

On the concluding day of the education program, Subject No. 7 demonstrated the procedures for the administration of oral hypoglycemics and urine testing. She identified the correct name and dosage of the medication, its purpose and the peak time of action. The subject poured the correct dose and took the medication without contaminating the other pills. She tested her urine specimen and interpreted the results accurately using the Ketodiastix method. The subject outlined the correct procedure for footcare. She mentioned that the procedure had been reviewed with her by both the physician and the nurse. "My feet are in bad shape, so I'll have to do this every day."

Table XI

Frequency Distribution of 'Right', 'Wrong', and 'Didn't Know' Answers on Part B of the Knowledge Pretest According to Category of Question

Category of Question		Right	Wrong	Didn't Know
Characteristics of Disease	(5)	3	0	2
Medications	(4)	1	1	2
Diet	(3)	3	0	0
Footcare	(3)	0	0	3
Urine Testing	(2)	1	0	1
Exercise	(1)	1	0	0
General	(2)	2	0	0
Total	20	11	1	8

Table XII

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-Up Posttest According to the Category of Question

		Posttest			Follow-up Posttest		
Category of Question		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of disease	(12)	12	0	0	12	0	0
Medications	(5)	2	2	1	2	3	0
Diet	(8)	5	3	0	3	0	0
Footcare	(3)	3	0	0	3	0	0
Urine-Testing	(2)	2	0	0	2	0	0
Exercise	(2)	2	0	0	2	0	0
General	(3)	3	0	0	3	0	0
Complications	(7)	5	2	0	6	1	0
Totals	42	34	7	1	36	6	0

( ) Number of questions in each category

During the follow-up interview, the subject reviewed the procedure for the administration of oral hypoglycemic medication. She was aware of the name and prescribed dose of the drug, its purpose and the time at which it should be taken. She was unable to identify the peak time of action of the medication. The subject keeps her medication on a shelf in her kitchen, where it is easily accessible. She has a reminder of the time for administration taped on her kitchen wall next to the refrigerator. The subject tested her urine using the Ketodiastix method. The procedure was followed correctly except for the timing. Instead of using a watch, she counted off the seconds. Her timing was five seconds too long for the acetone reading and nine seconds too long for the glucose reading. The subject outlined the corrected procedure for footcare.

Compliance with the Prescribed Therapeutic Regimen

Medication

The type and amount of oral hypoglycemic medication which the subject is taking has remained unchanged over the past six weeks. She takes her medication daily at 0730 h., just before breakfast. The subject has not noticed any side effects from the medication. The prescription is filled at a local drugstore. The subject has not experienced any difficulty with this aspect of her regimen and does not feel that it has inconvenienced her in any way. She expresses relief that she is not on insulin therapy. "I hope I don't have to start taking insulin, but if I do, at least I know how. I guess there are worse things that could happen." She has not noticed that there are specific activities or emotions which cause alterations in her blood sugar levels.

Reactions and Other Illnesses

Subject No. 7 has not experienced any hypoglycemic reactions; however she occasionally finds "that between nine and ten o'clock in the morning, I don't really feel too well." She is not sure if the oral hypoglycemic medication is the cause and has not mentioned these episodes to her physician. The subject finds that if she sits down and has a cup of tea the feeling passes. She has not experienced any health problems in the last six weeks.

Diet

Subject No. 7 realizes that following her diet is important "so that I can lose weight, keep my blood sugars down and prevent having to go on insulin." The subject is following the same 1,682 calorie C.D.A. diet prescribed for her at the metabolic centre. She does her own meal planning and preparation. Meals are planned one day at a time. Foods are either weighed or measured. The only special foods purchased are artificial sweetener and diet pop. She has tried some of the diet products such as water-packed canned fruits but is "unimpressed" with them. At this point in time, the subject is unable to determine if following a diabetic diet affects food costs. She has a large garden and uses the fresh produce as much a possible. The subject notices that the content of her diet has changed since following a diabetic diet. She now eats more vegetables and less bread products. Her diet plan calls for less protein content than she is used to. "I find it hard to limit my proteins."

The scheduling of the subject's meals has changed. Previously, she ate at irregular times and snacked whenever she felt like it. She now eats three meals and three snacks at designated times. A schedule for meals and snacks is posted on a wall in the kitchen. The subject does not eat in restaurants. On the one occasion she dined with friends, she "tried real hard to follow the diet plan." On weekends, most of the subject's children come home to visit. "Weekends have been hard. All the family come home and I'm constantly making meals. It's very tempting then." The subject states that she is "not finding it all that difficult to follow the diet." She admits that there are times when she does not follow it. Weekends are the time that she most often fails to comply. She notes that she goes on "occasional chocolate chip cookie binges."

Subject No. 7 has lost only five pounds since beginning the diet. "Its awfully hard for me to lose weight. It just doesn't come off me like it does some people." The subject has not contacted a dietitian with questions concerning diet. She volunteered the information that she had previously belonged to the T.O.P.S. (Take Off Pounds Sensibly) organization and was therefore familiar with how to plan diets and how to determine the calorie content of foods. She has seen her physician once since completing the education program. "He encouraged me to stick with my diet." The subject has been back to the metabolic centre once for a review session. She found it to be very encouraging.

Unlike her behaviour during other parts of the interview, when answering the questions concerning diet the subject appeared to be uncomfortable. She avoided eye contact with the investigator and answered the questions quickly and briefly.

Urine Testing

Subject No. 7 always tests her urine four times a day as instructed at the metabolic centre. She uses a double-voided specimen for the early-morning test. She records the results in her daily dairy and shows them to her physician. Testing urine specimens has not created any problems for the subject. She takes the container of Ketodiastix with her when she goes out. The only time that she has experienced a problem was when she spent the week-end with friends who had outdoor toilet facilities. Other than on that one occasion, the subject has tested her urine regularly. If she is late, her husband reminds her.

Footcare

The subject is aware of the importance of doing footcare regularly. "It's important because diabetics can have decreased feeling and there is an increased possibility of cuts and infection." She inspects and cleans her feet every night. She does nailcare as required and applies lotion twice a week. The condition of her feet, which were dry, dirty and cracked when she came to the metabolic centre, is much improved. Although the subject recalls that she was told not to, she continues to go barefoot, both in the house and in the garden. "I don't like to wear shoes." At the time of the follow-up visit, the subject had just come in from the garden. She was not wearing shoes and her feet were very dirty. The subject states: "My feet are fine. I don't have any loss of feeling and the leg cramps have disappeared. If I have any problems, I'll go and see my doctor here."

Exercise

Subject No. 7 realizes that exercise is important "to control my blood sugars and help me lose weight." She states: "I'm more active now than before, but I haven't tried to do anything regularly. I've never been much for exercise because I've been a very active lady." The subject has an exercise bike which she does not use. She recalls that she was told to exercise regularly for at least twenty minutes. "I guess it's laziness on my part really. Maybe I'll try."

Effects of the Disease

Subject No. 7 believes that her state of health has improved in the six weeks since she attended the program at the metabolic clinic. Her vision is no longer blurred and her extreme thirst has disappeared. She is no longer going to the bathroom as frequently. Subject No. 7 has also noticed a change in her mental status. "The memory loss, fatigue and lack of energy that I was so worried about is gone now." The subject identified the need to follow a diabetic diet as the major problem associated with having diabetes. "I hate the idea of being a sick person. I've always had a carefree nature. I find it confining not to be able to do what I want to." She does not find that having diabetes has prevented her from doing things. "In fact, it's actually helped. Before I had all those problems, I didn't have any energy to do things. Now my energy has really increased, I even feel like going out and dancing sometimes."

The subject has told her family and friends that she has diabetes. Her husband is concerned about her. He reminds her when it is time to test her urines and eat her snacks. Her other children are "relieved to know that the problem has been discovered." Her daughter, who lives at home, has been very helpful. She assisted her mother in drawing up a daily schedule of medications, meals, snacks and times for urine tests. She also helped to draw up a schedule for doctor's visits and blood tests. Subject No. 7 is concerned about the effect of diabetes on her children. "I've encouraged all of them to see their doctors for a check-up and tell them that there is diabetes in the family."

With the exception of "occasionally" not following her diet, the subject says that she tries to carefully follow her prescribed regimen. "I want to take care of myself. I want to be around in twenty years and the only way to do that is to take care of myself."

Reactions to the Education Experience

"Those four days at the clinic were essential to help me know what diabetes is and how I should take care of myself." The subject is positive about her contacts with her personal physician and those at the metabolic centre. They provided explanations about what diabetes is and the reasons for prescribing treatments and routines. The subject has seen her own physician twice since completing the education program. The nurse at the clinic was "very helpful and understanding. She talked to us in a way we could understand. What she said made a lot of sense." Subject No. 7 uses the information provided by the dietitians in her meal planning. "The dietitians were very helpful in teaching me how to plan a diabetic diet. However, they scare some of the people. They are so definite about things."

Subject No. 7 does not have any suggestions or concerns about the education program. She feels that it was "helpful." She does express some feelings about when she should have attended the program. "I think

I should have waited awhile before going to classes. I heard all those old stories and was really scared. Here I am with this awful disease and people can die from it. They teach you a lot at the clinic, but at first, you can't cope with it all. It would be much better to wait a month or six weeks and let people get adjusted to the fact that they have diabetes before giving them all that information."

The subject identifies the nurse at the centre as the person who was most helpful in teaching her to care for herself. She states she would have no hesitation in phoning her doctor at once if problems or question arise. Subject No. 7 expresses her present feelings about being diabetic: "At first I was really scared. I wondered what it would mean to mean and how it would affect my life. Now, it doesn't really bother me. I'm not always conscious of it. I just have to remember that I am one and deal with it."

Summary

Subject No. 7 displays a good understanding of the characteristics of diabetes and the care that it requires. Her knowledge level has remained fairly consistent over six weeks. Her performance on the follow-up posttest was two points higher than her score on the initial posttest.

The subject shows some changes in her ability to perform designated skills. She outlines the correct procedure for footcare. She administers her oral hypoglycemic medication safely and correctly, but her knowledge concerning time of peak action has decreased.

Urine-testing is carried out according to the correct procedure except that the subject does not accurately time the procedure.

Subject No. 7 completely or partially complies with all but one aspect of her prescribed therapeutic regimen. She takes her medication daily as prescribed. The subject tests her urines four times daily as instructed, but does not follow the procedure accurately. The subject attempts to follow a diabetic diet. She eats her meals at the designated times, but identifies "occasional" times when she does not follow the diet. She has lost only five pounds since commencing the diet. The subject inspects and cleans her feet daily. She does not always follow the complete footcare procedure and frequently goes barefoot, indoors and outside, in spite of knowing that this is not a safe practice.

The subject does not exercise at all. She knows that it is important and why it is important. She has an exercise bike which she does not use. Subject No. 7 does not appear to be convinced that a regular exercise program, beyond her present level of activity, is essential to her well-being.

The subject expresses a desire to remain healthy. She mentioned that none of her family were very long-lived and because of this, she knows that it is important to take care of herself. The subject was very surprised when, at the conclusion of the follow-up visit, it was explained that failure to correctly time the urine test could affect the accuracy of the reading. She explains losing only five pounds in six weeks by stating that "it just doesn't come off me like with some others." There is a disparity between how well the subject is actually complying with her prescribed therapeutic regimen and how well she perceives she is following it.

The subject is positive about the education program. She expresses the belief that it would be better to allow some time for adjustment to the fact of being diabetic before being presented with so much information about the disease.

CASE STUDY NUMBER EIGHT

Personal Profile

Subject No. 8 is a forty-one year old male. His parents came from the West Indies, but the subject was born and raised in Canada. He lives in a rented house with two friends. The subject's chart states he is divorced; however, the subject told the investigator that his wife and eight year old son were killed in an accident approximately one year ago. The subject, who is a university graduate, works full-time as the manager of an engineering firm. The subject has no pre-existing health problems.

The follow-up interview was conducted in the subject's home six weeks after he completed the four-day education program at the metabolic centre. There were no other people present at the interview.

Diagnosis and Education

Subject No. 8 had been experiencing symptoms for several weeks. He was very tired, thirsty and going to the bathroom frequently. His personal physician referred him to a specialist. The subject was referred to the metabolic centre directly from the physician's office for education and control of his diabetes. He arrived at the centre at mid-day on the first day of the program. Initially, the subject was upset to be at the centre. He did not appear to absorb what was happening to him. He wanted to telephone his employer and wanted to see the physician. When told that he could not see the physician until later in the afternoon the subject became upset. His voice was raised. He threatened to leave and expressed frustration because he was not in control of what was happening to him. Lunch was provided and the purpose of the program was explained. He then attended the afternoon classes.

On admission, the subject's blood sugar was 395 mg/dl. Physical examination revealed that the subject was 50 kg. over his ideal weight. His blood pressure was elevated. There was moderate muscle wasting. Other findings included reduced temperature sensation over his feet and slight impairment of vibration at his ankles.

The subject was adamant in his refusal to undergo insulin therapy. He stated that his mother had been diabetic and had never accepted the disease. What happened to her scared him and he was terrified of insulin injections. On the second day of classes, Subject No. 8 was started in oral hypoglycemic therapy (Chlorpropamide 500 mg. daily). The subject was told that if the medication, in conjunction with diet, was not effective in reducing his blood sugar then insulin therapy was inevitable. The subject expressed an eager desire to try oral medications. He promised that he would follow the prescribed regimen to control his blood sugars and lose weight.

Subject No. 8 attended classes alone. He said that there was no one to accompany him. During the course of the program, the subject became more settled. He attended all the classes and took extensive notes. The subject reviewed his notes each evening. He asked appropriate questions and participated in the learning activities. Even though he was very afraid of injections, Subject No. 8 consented to be the subject during the demonstration of the Dextrostix procedure. This procedure entails puncturing the subject's skin to obtain a drop of blood. Subject No. 8 was uneasy during the procedure, but stated afterwards that he was "relieved it's over even though it wasn't as bad as I thought it would be."

He was taught urine testing and footcare procedures and carried out the Dextrostix procedure on himself. Instructions for the daily administration of the oral hypoglycemic medication, including the purpose dose, effects and peak time of action were reviewed with him. The subject was also instructed and supervised in the preparation and administration of insulin injections. This was done because of the possibility that the subject would require insulin therapy in the future. It was the opinion of the nurse that the subject was capable and should have no real problems in giving himself injections.

The subject completed all of the assignments. He encountered no problems with the written diet assignments and did well on the written assignments for adjusting insulin dosages. He was aware of the fact that his excess weight was aggravating his condition and said he was "very set" on losing weight, especially if it meant that he would not need insulin injections. By the end of the four days, the subject appeared to be much more accepting of this diagnosis. For example, after class one day he went shopping and purchased an initialled carrying-case to contain his urine testing equipment. He seemed pleased with his purchase and told the investigator that "it will be really easy to do urine tests at work with this."

At the completion of the program, the subject's blood sugars were: fasting - 203 mg/dl.; 1000 h. - 200 mg/dl.; and 1400 h. - 211 mg/dl. He was instructed to take 500 mg. of Chlorpropamide daily and to follow a 1,750 calorie C.D.A. diet containing 79 gm. of protein, 220 gm. of carbohydrate and 60 gm. of fat. He was to test his urines four times a day and have weekly blood tests. The importance of losing weight was emphasized by all of the staff at the centre. The subject was told to return in two weeks for a progress check and for review.

Knowledge Performance

The Pretest

Part A. Subject No. 8 responded to the question asking what diabetes meant to him by attempting to define the disease. "Diabetes is a condition of low or high sugar content in the blood. Diabetes is a condition that can be controlled but not cured."

The subject's mother had been an insulin-dependent diabetic and her illness had left a lasting impression. "My mother had a very hard time adjusting to the fact that she was diabetic. There was a lot of fear and anxiety involved and I learned all of the negative aspects rather than proper control."

Part B. Subject No. 8 scored 12/20 on the true-false questions. He correctly answered all of the questions about exercise and general health practices. He answered some questions correctly in all other categories with the exception of footcare, but incorrect or deficient knowledge was also displayed in these categories. An analysis of the subject's responses to Part B of the pretest is presented in Table XIII.

The Posttest

The subject scored 28/42 with 16/20 on Part A and 12/22 on Part B. He correctly answered all of the questions about footcare, urine testing and general health practices. The majority of questions concerning characteristics of the disease, medication and exercise were also answered correctly. The subject had some difficulty with questions about diet. He did not appear to understand the exchange or choice system and made inappropriate food choices. The area where the greatest lack of knowledge was displayed was with complications of the disease. The subject did not know how to treat an insulin reaction and was unable to answer any questions concerning symptoms of hyperglycemia and hypoglycemia.

The Follow-Up Posttest

On the follow-up posttest, the subject's score increase by seven points over his initial posttest score. He achieved a score of 35/42 with 19/20 on Part A and 16/22 on Part B. He showed improvement in all areas with the exception of medications. The subject was able to correctly answer all of the questions concerning characteristics of the disease, footcare, urine testing, exercise and general health practices. His performance on diet questions increased. He was able to make appropriate food choices. The subject was also able to identify most of the symptoms of hyperglycemia and hypoglycemia and to identify the correct treatment for an insulin reaction. An analysis of the subject's responses to the two administrations of the post-test is presented in Table XIV.

Skills Performance

Subject No. 8 demonstrated the administration of oral hypoglycemics and the urine testing procedure on the concluding day of the education program. He was able to identify the correct name, dose, purpose and peak time of action of the oral hypoglycemic medication. He poured the correct dose accurately without contaminating the other pills. The subject tested his urine and interpreted the results accurately using both the Two-Drop Clinitest and the Ketodiastix methods. The procedure for footcare was outlined correctly.

During the follow-up visit, Subject No. 8 demonstrated the procedure of the administration of his oral hypoglycemic medication. He poured the correct dose of medication. He was aware of the name, dose, purpose and effects of the medication. He was not sure of the peak time of action but thought it was "about thirty hours." The subject keeps his container of pills in a drawer in his bedside table so that it is easily accessible and will not be confused with the medications of the people with whom he shares the house. The urine testing procedure was performed correctly and the results interpreted accurately using the Two-Drop Clinitest method. The procedure for footcare was outlined as it was taught in class.

Table XIII

Frequency Distribution of 'Right', 'Wrong', and 'Didn't Know' Answers on Part B of the Knowledge Pretest According to Category of Question

Category of Question		Right	Wrong	Didn't Know
Characteristics of Disease	(5)	4	1	0
Medications	(4)	2	1	1
Diet	(3)	2	1	0
Footcare	(3)	0	1	2
Urine Testing	(2)	1	1	0
Exercise	(1)	1	0	0
General	(2)	2	0	0
Total	20	12	5	3

Table XIV

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-Up Posttest According to the Category of Question

Category of Question		Posttest Right	Posttest Wrong	Posttest Didn't Know	Follow-up Posttest Right	Follow-up Posttest Wrong	Follow-up Posttest Didn't Know
Characteristics of disease	(12)	11	1	0	12	0	0
Medications	(5)	4	1	0	3	1	1
Diet	(8)	3	1	4	5	1	2
Footcare	(3)	3	0	0	3	0	0
Urine-Testing	(2)	2	0	0	2	0	0
Exercise	(2)	1	1	0	2	0	0
General	(3)	3	0	0	3	0	0
Complications	(7)	1	0	6	5	2	0
Totals	42	28	4	10	35	4	3

( ) Number of questions in each category

Compliance with the Prescribed Therapeutic Regimen

Medication

Subject No. 8 continues to take the same type and amount of medication which was prescribed for him at the metabolic centre. He takes his medication every morning at 0800 h. with breakfast. He does not feel that this aspect of treatment interferes with his life except for the weekends. "I used to sleep in all the time. Now I get up, take my pills, eat breakfast and go back to bed." The subject obtains his medication from a local drugstore. He has not noticed any specific activity or emotion which causes his blood sugars to change.

Reactions and Other Illnesses

The subject has not experienced any insulin reactions. In fact, until asked about reactions by the investigator, the subject had forgotten that insulin reactions can occur with people taking oral hypoglycemic medications. He has not noticed any side effects from the medication. The subject's health has been good during the last six weeks. "I feel better now than I have in some months."

Diet

Subject No. 8 realizes that following the prescribed diet is important. He identifies two reasons: "It helps to control the blood sugars. It's also important for me to follow so I won't have to take insulin. I'm trying really hard to follow the diet. I've already lost twenty pounds." The subject is following the same 1,750 calorie C.D.A. diet which was prescribed for him at the metabolic centre.

The subject plans his meals one day at a time. He shares the responsibility for cooking with his two house-mates. "When it's my turn, they eat what I make. When it's their turns, I eat what I can and supplement it." The subject uses the diet book he received at the centre as the basis for planning his meals and snacks. He measures the food that he eats. The subject has not noticed any difference in food shopping "except that I avoid buying pastries and junk food." He has not noticed a change in the cost of food. He notes that he does not buy any special diet foods.

The subject has noticed a marked change in his meal schedule. "My eating habits have changed for the better. Before, I didn't used to eat breakfast or lunch. I ate from when I got home from work until bedtime. Now I eat three meals and three snacks which I always try to have on time." The subject finds it more difficult to follow the diet on weekends that during the week, but he tries to take his pills and eat his meals at the correct times. The subject seldom eats in restaurants. "If I go out with friends, it's usually just for coffee. It's easier that way."

Subject No. 8 feels that "willpower" is the major difficulty in following a diabetic diet. "It's sometimes hard to stick with it if I'm out - like at a baseball game. It's especially hard if I see others eating things that I can't have. I usually take some fruit such as apples for snacks so I can eat those."

The subject states that he follows the diet carefully and does not go off it. During the interview, he had three cups of coffee. He added milk to all of them. When asked if this milk was part of his diet the subject replied: "No it's not. I won't give up milk with my coffee. But that's the only thing that I have which isn't part of my diet." The subject has been back to the metabolic centre twice since completing the education program. On each occasion, he spoke with a dietitian. He took the opportunity to ask questions about his diet. Subject No. 8 has also spoken to the doctor about his diet. "The doctor emphasized the importance of me following the diet. He also discussed the possibility of me getting off the pills entirely if I lost enough weight. I sure hope I can do it. That would be really great."

Urine Testing

Subject No. 8 tests his urine four times daily as instructed at the metabolic centre. He uses a double-voided specimen for his early-morning urine test. The results are recorded in the daily dairy and shown to the doctor when he visits the metabolic centre. The subject does not find that testing his urine four times a day creates any problem for him at work. "There is a bathroom at work. I have all my equipment in my bag. I just go in, lock the door and test the specimen."

Footcare

The subject relates that footcare is necessary "to prevent infections and problems with the skin." He does footcare daily and cuts his toenails as instructed. The subject notices that his feet are now in much better condition. He has not noticed any problems with his feet. "If I did, I'd see the doctor at once."

Exercise

Subject No. 8 states: "Exercise is very important if I'm going to get off medications." He recalls that the importance of regular exercise was emphasized at the metabolic centre. The subject has markedly changed his level of activity. "Before I found out that I was diabetic, I did very little. I was so tired all the time. I just used to come home from work and sit in front of the T.V. and eat until bedtime." The subject now exercises every day. He has purchased a bicycle and has joined a racquetball club. "I feel much better since I began to exercise regularly. I'm much more alert and fit."

Effects of the Disease

Subject No. 8 has noticed several changes in his life since becoming diabetic. He feels much better. His symptoms have gone and he has much more energy. The greatest change which he notices is: "My life now follows a much more regular and more healthy routine. The major problems with having diabetes are having to follow a diet and always having to exercise willpower." The subject does not feel that being diabetic has prevented him from doing most of the things that he wishes to do. "I just got back from a two-week trip to Jamaica and I managed fine. I had no problems at all in doing what I was supposed to."

The only people that the subject has told about the fact that he has diabetes are the two people with whom he shares the house. "It's a very personal thing. I don't see why others have to know." The subject carefully follows his prescribed therapeutic regimen. "I try not to do things that I shouldn't. It's hard sometimes following the diet and exercising regularly. But it's important to me that I don't go on insulin. The chance that I may even get off pills helps me to do the things that I should."

Reactions to the Education Program

Subject No. 8 believes that the education program was "very helpful in understanding about diabetes and what I have to do for myself." The physician helped him very much by telling him what diabetes is, why things were being done, and what he should do to help himself. He has seen the physician twice, when he returned to the centre.

The nurse taught the subject "all about medications, urine testing, footcare, exercise and general information about how I should be looking after myself." He is very positive about his contacts with the dietitians. "They were very helpful. They taught me much about the diet, such as how to plan, measure and prepare foods and the kinds of foods I should be eating." The subject found all of the personnel at the centre to be very good in helping him to learn to care for himself. He identifies the nurse as being particularly helpful in the learning process.

During the subject's two return trips to the centre, he has asked questions about his condition and his regimen. If problems arise about his medication, he will phone his physician. If questions arise about care of the disease, he will contact the staff at the metabolic centre. The subject does not have any suggestions or concerns about the material presented in the education program. He comments on its helpfulness. He expresses his present feelings about being diabetic: "I feel good about it. In fact, in a funny sort of way it has helped me. It has forced me to make some decisions about my life. I feel that I have things well under control."

Summary

Subject No. 8 has a good understanding of the characteristics of the disease and the care involved in his prescribed therapeutic regimen. As reflected by the posttest scores, his level of knowledge has risen by seven points over the last six weeks. The subject's ability to perform the skills of oral hypoglycemic medication administration, urine testing and footcare has remained consistent. He is able to carry out these procedures accurately and confidently.

The subject complies with all aspects of his prescribed therapeutic regimen. He administers his medication, tests his urine, does footcare and exercises regularly as instructed by the physician and staff at the metabolic centre. He tries to follow his diet carefully and, with the exception of adding milk to his coffee he does so. The subject has lost twenty pounds in the six weeks since he began following a diabetic diet.

The subject is very motivated to follow his prescribed therapeutic regimen. At first, his motivation was based on fear of insulin injections and his willingness to try other alternatives. Now, since hearing about the possibility that he can go off medications completely, the subject is motivated to achieve this goal.

The subject is positive about the education experience. He found the material presented very meaningful and applies it well to his daily routine. He has no suggestions or concerns about the program. The staff were all very helpful. Subject No. 8 is able to identify some of the positive results associated with his diabetes. He believes that diabetes is something with which he can cope.

CASE STUDY NUMBER NINE

Personal Profile

Subject No. 9 is a sixty-five year old male. He and his wife live alone in their own home which is located in a small community situated approximately thirty miles northeast of Edmonton. The subject worked full-time as a truck driver until he was hospitalized for surgery in June 1981. The subject attended school until he completed grade five. He was required to leave school to go to work. The subject's wife works full-time in the dietary department of the local hospital.

Subject No. 9 states that up until now, he has always enjoyed good health. "I've hardly ever been sick." He was diagnosed as having diabetes eighteen years ago. Ten years ago, he was started on oral hypoglycemic therapy. At that time, he was told that he should be on insulin. The subject has always refused to accept the need for insulin therapy because he has an aversion to needles. He has never attended an education program.

The follow-up interview was conducted in the subject's home six weeks after he had completed the education program at the metabolic centre. The subject now has a permanent tracheostomy and is undergoing speech therapy to learn how to talk. He responded to interview questions in a variety of ways including speech, sign language, and by writing his answers on a pad. His wife assisted him in expressing some of his answers to the interview questions.

Diagnosis and Education

The subject had been experiencing progressive hoarseness of his voice since December, 1980. He went to see his physician, who referred him to a specialist. In May 1981, a biopsy was done and revealed that the subject had carcinoma of the left vocal cord. The subject was admitted to hospital for surgery. Before surgery was done, Subject No. 9's health status was assessed. He was told that surgery could not be done until his diabetes was brought under control. This involved adhering to a diabetic regimen incuding daily insulin therapy. The subject reluctantly consented. The surgery, a radical neck dissection and total largyagectomy, was performed. After the acute post-operative phase the subject was referred to the metabolic centre for education and control of his diabetes.

The subject and his wife attending the program at the metabolic centre over a two-week period. They attended for four days on one week and came back for the first two days of the following week. During the first three days of the program, the subject was still a patient in the hospital. He came from the hospital to the metabolic centre each morning and returned to the hospital at the end of each day. After being discharged from the hospital, the subject continued to attend the education program. The subject was accompanied by his wife for the six days. His married daughter also attended five days of the program.

On the first day of the program, the subject's blood sugars were: fasting - 59 mg/dl.; 1100 h. - 155 mg/dl.; and 1430 h. - 32 mg/dl. His insulin dosage was undergoing daily adjustment. On the first day, he received 34 units of C.Z.I. insulin and 44 units of Lente insulin. The subject, his wife and his daughter were taught how to test urine specimens, do Destrostix blood glucose determinations and how to draw up and administer insulin. Subject No. 9 was very resistant to learning how to give himself injections. He refused to try several times. On the one occasion that he was persuaded to do so, he became very unsettled. Both his wife and his daughter learned how to prepare and inject insulin without difficulty.

During the first few days of the program, the subject felt very weak and tired. He attended the classes and listened to the material presented but did not take notes. He communicated by writing on a slate. The subject's wife and daughter took notes and asked appropriate questions. Towards the end of the week, the subject was feeling stronger and participated more actively. The subject's wife was very concerned about her husband and could not concentrate well. She encountered some difficulty with the written diet assignments, but by the end of the sixth day, felt quite capable of caring for her husband at home and managing all of the aspects of his prescribed therapeutic regimen.

At the end of the first week of the program, the subject's blood sugars were: fasting - 98 mg/dl.; 1100 h. - 170 mg/dl.; and 1430 h. - 100 mg/dl. He was taking 22 units of C.Z.I. insulin and 30 units of Lente insulin. A 2,304 calorie C.D.A. diet, containing 111 gm. of protein, 370 gm. of carbohydrate and 95 gm. of fat was prescribed for him. He was encouraged to eat all of his meals and snacks so that he would gain weight. Other instructions included testing his urines four times a day and having weekly blood sugars done. He was told to return to the centre in one month. The subject had developed a wound infection at the surgical site. It was arranged that the home care nurse in his town would come to his home to change the dressing as required.

The subject's wife purchased a scale and some books about diabetes from the centre. Before returning to their home, the couple purchased a Glucoscan machine to monitor capillary blood sugars and an Autolet kit from the Canadian Diabetes Association office.

Knowledge Performance

The Pretest

Due to his weak condition, the subject felt unable to complete the pretest before attending the lectures. Conversation with the subject revealed only a superficial understanding of diabetes. "Diabetes is something wrong with the sugar." When asked what diabetes meant to him, the subject responded: "Needles. I hate them. I don't want them. I used to take pills." According to the subject, he has hever had contact with other diabetic individuals.

The Posttest

Subject No. 9 scored 26/42 with 14/20 on Part A and 12/22 on Part B. Footcare was the only category in which all questions were answered correctly. The majority of questions concerning characteristics of the disease and general health practices were also answered correctly. The subject experienced difficulty in answering the comprehensive questions, particularly in the areas of diet, medications and complications. He was unable to answer questions concerning the interrelationships of various aspects of treatment.

The Follow-up Posttest

On the follow-up posttest, the subject's knowledge performance increased by five points. He achieved a score of 31/42 with 16/20 on Part A and 15/22 on Part B. Again, footcare was the only category in which all of the questions were answered correctly. The subject's scores in the areas of characteristics of the disease, diet and urine testing remained the same. An increased number of questions were answered correctly in all remaining categories. The subject was able to answer more comprehensive questions, particularly in the categories relating to medications and complications. He displayed a greater understanding of the interrelationships of various aspects of care. For example, he correctly answered the question concerning the relationship between physical activity and exercise. An analysis of the subjects responses to the two administrations of the posttest is presented in Table XV.

Skills Performance

On the concluding day of the education program, Subject No. 9 was asked to demonstrate the insulin and urine testing procedures. The subject refused to draw up and administer his insulin. His wife, who said she would be carrying out the procedure at home, was observed. She prepared and gave the injection following the correct procedure. She displayed accuracy and confidence. The subject tested his urine specimen using the Diastix method. He followed the correct procedure and interpreted the results accurately. Subject No. 9 outlined the procedure for footcare as it was taught in class.

Table XV

A Comparison of Frequency Distributions of 'Right'
'Wrong', and 'Didn't Know' answers of the Knowledge Posttest
and Follow-Up Posttest According to the Category of Question

		Posttest			Follow-up Posttest		
Category of Question		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of disease	(12)	11	1	0	11	0	1
Medications	(5)	2	1	2	4	0	1
Diet	(8)	4	3	1	4	2	2
Footcare	(3)	3	0	0	3	0	0
Urine-Testing	(2)	1	0	1	1	1	0
Exercise	(2)	0	1	1	1	1	0
General	(3)	2	1	0	2	0	1
Complications	(7)	3	1	3	5	2	0
Totals	42	26	8	8	31	6	5

( ) Number of questions in each category

At the follow-up interview, the subject again refused to perform the insulin administration procedure. His wife had prepared and given all of the injections since the subject had come home from hospital. The subject said: "I still hate needles. I won't ever do it myself." The subject's wife drew up and administered the injection following the correct procedure. The subject looked away while the procedure was carried out. His wife stated: "He never looks when I do it. He still finds it very hard." Subject No. 9 tested his urine using the Diastix method. He followed the procedure correctly, but said he was not sure how long the specimen should be timed. He confirmed with the investigator that the glucose result should be read after thirty seconds. The subject outlined the correct procedure for footcare.

Compliance With the Prescribed Therapeutic Regimen

Medication

The subject's insulin dosage has remained unchanged during the last six weeks. The insulin is given to him by his wife every morning between at 0630 h. and 0700 h. The sites are rotated daily using a clockwise rotation. The arms, abdomen and thighs are used as injection sites. The subject's wife has not experienced any difficulty in giving the daily injections. The subject does not feel that the daily injection has caused much change in his daily routine. "I've always gotten up early so that hasn't changed. It means my wife has more to do in the morning before she goes to work, but it has to be done so she does it." The subject encountered no difficulty in obtaining the necessary equipment.

The syringes were purchased at the Canadian Diabetes Association Office in Edmonton. Subject No. 9 notices that if he gets very upset, his blood sugar rises. It has happened twice in the last six weeks. He does not increase the amount of insulin when this happens. "I'm usually back to normal the next day."

Reactions and Other Illnesses

Although Subject No. 9 had some reactions while in the hospital and during the education program, he has not had any since returning home. He can recognize when a reaction is occurring because he becomes "pale, hungry and shaky." The subject knows to "take something sweet" to treat the reactions. He always carries Lifesavers in his pocket and has quick-acting glucose foods stored in the glove compartment of his car. To prevent reactions, the subject ensures that he eats his meals and snacks on time. The physician was made aware of the fact when the subject experienced insulin reactions while attending the education program. The insulin dosage was reduced on the day following the occurrence of a reaction. The subject is not aware of any effect on family members. His wife states: "I keep an eye on him and watch for the signs." The subject's health has improved in the last six weeks. He is feeling stronger and more energetic. He has gained some weight, and the infection in his surgical site is clearing up.

Diet

Subject No. 9 believes that it is important to follow his diet because "it keeps my blood sugar under control." His diet has remained the same since he has returned home. He continues to follow a 2,304 calorie C.D.A. diet. Meal planning and preparation is carried out by the subject's wife. She weighs or measures food portions except when the subject is eating out. When this happens, food portions are estimated. As the subject's wife works full-time, she finds it convenient to plan and prepare the meals for several days at a time. She cooks a large amount of food and divides it into correct proportions. The meals are frozen in individual servings. When the meal is to be used, it is put into the microwave oven to be heated. In this way, the subject is able to have the correct amounts of food in the form of hot meals even when his wife is working. The subject's wife has not noticed a difference in food costs. The only special food purchased is artificial sweetener. The couple has a large garden. They use the produce from the garden in the meals they eat. The subject's wife is planning to preserve much of the garden produce using recipes that can be used in a diabetic diet.

The subject does not find that his meal schedule has changed. He has always eaten three meals and snacks. He does find that he must now remember to eat his snacks on time and take them with him when he goes out. His schedule does not vary on weekends. Subject No. 9 has not experienced difficulty with the diet. His wife notices that preparation now takes more time because the meals must be carefully planned and measured. The subject follows his diet carefully. "I want to stay healthy. Maybe I can get back on pills instead of needles." He says that the only time he might go off his diet is when he eats out. Even then he tries to follow his meal pattern. The subject expresses only one concern about the diet. In the past six weeks he has gained 1.5 kg. and is now wondering if he should reduce his food intake. He realizes that his doctor wanted him to gain weight but is concerned because he does not want to gain too much. "I weigh enough now. I don't want to gain more."

Neither the subject nor his wife have contacted the dietitians at the metabolic centre with questions concerning diet. The subject's wife has directed her questions to the dietitian at her place of employment. For example, she checked with the dietitian about whether cooking large amounts of food and freezing it in individual servings would work. The subject has returned to the metabolic centre once. He did not speak to the doctor or dietitian about his diet. The next time he sees the doctor, the subject is planning to ask him about reducing the amount of food so that he will not gain weight.

Urine Testing

Subject No. 9 tests his urine twice a day when he first gets up and before lunch. He recalls that he was told to test it four times a day, but states: "In the first few weeks they were all negative so now I only do them twice a day." A double-voided specimen is not used. The subject is not sure what the term means. "I use the first specimen because it's easier." He records the results of the tests in his daily diary and shows them to his physician. Even though his urines have sometimes shown an elevated glucose with the 1100 h. specimen, the subject has not used the urine test to adjust his insulin. "It's only sometimes. It's usually negative the next day." The subject has no difficulty in testing his urine specimens. "If I go out, I just take the container with me."

Footcare

Subject No. 9 has not noticed any problems with his feet or his skin. He believes it is important to do footcare "so my feet won't get infected." He bathes daily, applies lotion and cuts his toenails as instructed. There is decreased sensation in his feet so he exercises care about the temperature of his bathwater. "I never use hot water. I always test the temperature before I get in." The subject said that he would see his doctor at once if he experienced any problems with his feet.

Exercise

Subject No. 9 has found that his level of activity has changed. "Before, I was driving a truck all day - I don't do any special exercise. Now I work in the garden and go for a walk at least once a day. He recalls: "They told me I was supposed to exercise regularly. The doctors wanted me to get about more so that I'd gain strength." The subject believes that regular exercise is helping him. "I feel better since I've been getting out more and going for walks. I'm much stronger." Regular exercise does not create any problems for him: "I'm trying to get better and this helps me."

Effects of the Disease

The subject identifies the need to eat on time and the need to test his urines as the major changes he has noticed since becoming an insulin-dependent diabetic. He feels that the major problem with the disease is "having to take needles." The subject does not believe that being diabetic has prevented him from doing what he wishes. He notes that he does not have as much energy as he used to, but attributes this to the effects of his neck surgery. His relatives and friends are aware of the fact that he is a diabetic and taking insulin. "They are concerned but they all want me to get better." Subject No. 9 has noticed some effects of the disease on member of his family. "My daughter had to learn how to give me injections. She does fine. My wife has to do more things like making meals and giving me my shots. She does a real good job." The subject says that he does not do things that he knows he shouldn't. "I want to get better, so I do what I'm supposed to."

Reactions to the Education Experience

The major source of information about diabetes for Subject No. 9 were the classes he attended at the metabolic centre. He had gained some knowledge previously through contacts with his personal physician, but states: "I didn't know much before." The physician at the centre provided him with information relating to the disease and why insulin was a necessary part of treatment. He has seen the physician once when he returned to the metabolic centre for review.

The subject learned "a lot" about the disease from the nurse at the centre. "She taught us all about urine tests, injections and other things that I should do." Both the subject and his wife identified the nurse as the individual most helpful in assisting them to learn about diabetes and its care. The subject found the dietitians to be helpful. "They taught us how to manage the diet."

Subject No. 9 had no suggestions concerning the education program, but his wife does. "It's important that the staff consider your feelings. It takes a while to learn all of the things they tell you. They shouldn't make you feel stupid." Although neither the subject nor his wife have suggestions for other topics to be included both express concern about the amount of material presented. The subject's wife states: "There's so much to learn at one time that you're not really sure that you can absorb it all.

The couple have several sources of information which they utilize when questions arise. The home care nurse frequently visits the home to change the subject's dressing. She has been asked questions concerning injections. For information about diet, the subject's wife consults the dietitian at her place of employment. The subject realizes that he can contact the staff at the centre if he wishes. He states that he will contact the physician or the nurse at the clinic if urgent problems arise. The subject's feelings about being insulin-dependent and having to follow a routine have undergone a change from his initial resistance. "It's a bother but it has to be done. I can fit it into my life. I wish I could get off needles and back to pills because I don't like injections. I'll never do it myself. We're getting along alright now."

Summary

Subject No. 9 displayed only a fair understanding of diabetes and the care it requires at the conclusion of the education program. His level of knowledge, as evidenced by the results of the follow-up posttest, has increased in the six weeks since the subject completed the education program. The subject's level of skill performance has remained consistent. He continues to refuse to draw up and give his daily insulin injection. His wife carries out the procedure accurately and with confidence. The subject is able to perform the urine test procedure accurately. He performs the footcare procedure as taught.

Subject No. 9 completely or partially complies with all aspects of his prescribed therapeutic regimen. He carries out footcare daily and exercises regularly. His diet plan is followed closely, even when he eats out. Although the subject refuses to give himself insulin injections, he receives his daily injection at the same time of the day, utilizing a site rotation schedule. The fact that he permits the injection to be given to him denotes at least partial acceptance of the need and willingness to comply with this aspect of treatment. The subject only partially complies with the urine testing aspect of his regimen. He tests his urines twice a day instead of the prescribed four times. The reason given for this variation is that the tests are always negative.

Subject No. 9 is strongly motivated to regain his health and recuperate from the effects of surgery. He believes that following the directions of his physicians will help him achieve this goal. The subject does not appear to totally accept the need for daily insulin injections. Several times during the course of the interview, he spoke about how he hated needles and wanted to "get back on pills." This desire seems to be one reason why the subject follows his diet closely. The subject's family are very supportive and assist him in following his prescribed therapuetic regimen.

The subject and his wife have several information sources which they utilize when questions arise. Although neither individual has specific suggestions for changing or improving the education program both express concern at the large amount of material to be learned. The subject's wife has some strong feelings about the importance of not being made to feel stupid. Overall, the subject and his wife are positive about the education program and believe that they learned much valuable information which they can use.

CASE STUDY NUMBER TEN

Personal Profile

Subject No. 10 is a seventy-year old widowed female of Ukranian descent. She lives in a small community situated approximately 70 miles northeast of Edmonton. The subject lives alone in a small house. Her children are grown and live in other areas. Her son lives in Edmonton and her daughter lives in a small community nine miles from where her mother lives. The subject completed a grade eight education. She is fluent in oral and written English. Subject No. 10 is very active. She spends a major portion of her time working in her large garden. She frequently visits friends and relatives in outlying communites.

The subject was initially diagnosed as having diabetes in 1974. She was placed on pills to control her blood sugar levels. The subject does not know the name of the pills. She says that she was not given any instructions about special care, nor did she receive any education about diabetes. In November 1980, the subject was started on insulin therapy. This occurred when she was hospitalized because of "stomach problems." At that time she was given a diabetic diet and told to test her urines, but did not participate in any education program. The subject states: "What I know about diabetes I learned from my daughter-in-law, who is a nurse."

The follow-up interview was conducted in the subject's home six weeks after she had attended the four-day education program at the metabolic centre. Only the subject and the investigator were present at the interview.

Diagnosis and Education

The subject went to see her physician because of swelling in her hands and feet. She also noticed that she was gaining weight. She was referred to the metabolic clinic for education and control of her diabetes.

On admission to the metabolic centre, the subject's blood sugars were: fasting - 170 mg/dl.; 1100 h. - 206 mg/dl.; and 1500 h. - 113 mg/dl. She was taking 16 units of C.Z.I. insulin and 14 units of Lente insulin daily. On physical examination, the subject was found to have an elevated blood sugar, periathritis of the shoulders and bilateral opacities of the lenses of her eyes. She also had reduced vibration sense at the ankles.

The subject was accompanied by a member of her family during each day of the program. Her son was with her for the first two days, her daughter-in-law came for the third day and her daughter for the fourth day. Principles of insulin preparation and administration, urine testing and footcare were reviewed with the subject. She was also taught to do Dextrostix blood sugar determinations. The subject actively participated in all learning activities. With the assistance of family members, she completed the written diet assignments which were done well. She was able to accurately select and measure appropriate foods. The subject was able to apply the information taught in class. For example, she experienced an insulin reaction while shopping and was able to treat it appropriately. She mentioned that she experienced reactions if her meals and snacks were not eaten on time.

The subject seemed enthusiastic about the classes. She bought her carrying case containing her insulin and urine testing supplies with her to class each day. One evening, she baked some muffins using a recipe given out in class that day. She brought the muffins to class to share with others. In casual conversation, the subject stated: "I want to learn to do things right. I want to be able to take care of myself."

At the conclusion of the program her blood sugars were: fasting - 122 mg/dl.; 1100 h. - 150 mg/dl.; and 1500 h. - 118 mg/dl. Her insulin dosage had been adjusted during the week. She was discharged with a daily insulin dose of 14 units of C.Z.I.and 18 units of Lente insulin. She was told to follow a 1,500 calorie C.D.A. diet containing 76 gm. of protein, 203 gm. of carbohydrate and 45 gm. of fat. Her blood sugars were to be tested weekly and she was to test her urines four times a day. The subject was given encouragement to keep up with her physical activity.

The subject purchased a magnifier to enable her to see the markings on the insulin syringe more clearly. She said that she already had a scale for measuring food at home.

Knowledge Performance

The Pretest

Part A. Subject No. 10 responded to the question aking her to describe what diabetes meant to her: "Diabetes means to me as long as I control my food, weight and insulin correctly everything would be O.K. Life goes on well." Her contacts with individuals with diabetes include a good friend and her grandson. "I learned a lot from my friend. How to take care of myself good. All about insulin, diet and urine testing."

Part B. The subject score 14/20 on the true-false questions. She correctly answered all of the questions concerning diet, urine testing, exercise and general health practices. The subject displayed the greatest lack of knowledge in questions concerning medications and questions about the interrelationships among various aspects of treatment. An analysis of the subject's responses to Part B of the pretest is presented in Table XVI.

The Posttest

Subject 10 scored 34/42 on the posttest, with 20/20 on Part A and 14/22 on Part B. She experienced difficulty with the comprehensive questions, particularly those concerning diet and complications. She made inappropriate food selections for a diabetic diet. While able to identify some symptoms of hyperglycemic, she was unable to identify any of the symptoms of hypoglycemia.

The Follow-Up Posttest

The subject's knowledge level increased by three points on the follow-up posttest. She achieved a score of 37/42 with 19/20 on Part A and 18/22 on Part B. The subject was able to correctly answer all of the questions concerning characteristics of the disease, medication, footcare, exercise and general health practices. Her score increased in the areas of characteristics of the disease, diet and complications and decreased in the category of urine testing. An analysis of the subject's

Table XVI

Frequency Distribution of 'Right', 'Wrong', and 'Didn't Know', Answers on Part B of the Knowledge Pretest According to Category of Question

Category of Question		Right	Wrong	Didn't Know
Characteristics of Disease	(5)	3	2	0
Medications	(4)	1	2	1
Diet	(3)	3	0	0
Footcare	(3)	2	1	0
Urine Testing	(2)	2	0	0
Exercise	(1)	1	0	0
General	(2)	2	0	0
Total	20	14	5	1

Table XVII

A Comparison of Frequency Distributions of 'Right', 'Wrong', and 'Didn't Know' Answers of the Knowledge Posttest and Follow-Up Posttest According to the Category of Question

		Posttest			Follow-up Posttest		
Category of Question		Right	Wrong	Didn't Know	Right	Wrong	Didn't Know
Characteristics of disease	(12)	10	2	0	12	0	0
Medications	(5)	5	0	0	5	0	0
Diet	(8)	5	3	0	6	2	0
Footcare	(3)	3	0	0	3	0	0
Urine-Testing	(2)	2	0	0	1	1	0
Exercise	(2)	2	0	0	2	0	0
General	(3)	3	0	0	3	0	0
Complications	(7)	4	3	0	5	2	0
Totals	42	34	8	0	37	5	0

( ) Number of questions in each category

response to the two administrations of the posttest is presented in Table XVII.

Skills Performance

On the concluding day of the education program, Subject No. 10 demonstrated the procedures for the preparation and adminstration of insulin and urine testing. While drawing up the two types of insulin, the subject experienced difficulty in reading the dosages accurately. She stated that the lines were blurred and she could not see them clearly. With the use of a magnifier, which attaches to the syringe, she was able to draw up the correct dosage. The subject injected the insulin following the correct procedure. The urine testing procedure was carried out utilizing the Diastix method. The subject tested the specimen and interpreted the results accurately. She outlined the footcare procedure as it was taught in class.

At the follow-up interview, the subject again experienced difficulty in drawing up the prescribed dosage of insulin. She was to take 16 units of C.Z.I. insulin and 14 units of Lente insulin. Incorrect amounts of both types of insulin were drawn up. She drew up 18 units of C.Z.I. insulin and 16 units of Lente insulin. She did not use the magnifier. She could not immediately find it. "I don't bother with it 'cause it's too much trouble." The subject did not note the presence of two large air bubbles in the syringe. She administered the insulin following the correct procedure.

The subject tested the urine specimen utilizing the Diastix method. She did not use a watch to time the test. Instead, she counted the seconds. She allowed fifteen seconds to elapse between dipping the reactive strip into the urine and reading the result instead of the correct thirty seconds. She stated that she never used a watch to time the procedure. Subject No. 10 outlined the correct procedure for footcare. She showed the investigator her footcare basin and equipment which was stored in a cupboard in the kitchen.

Compliance With the Prescribed Therapeutic Regimen

Medication

The subject's insulin dosage has been adjusted once by her personal physician in the last six weeks, based on the results of her weekly blood tests. The subject takes her insulin daily at 0730 h. The sites for injection are rotated daily. The subject uses only her thighs and abdomen as injection sites. "I can't reach the rest." She has all of her injection equipment in her carrying case which is kept in the living room. When she travels, she takes the case with her. Subject No. 10 purchases all of the necessary supplies in Edmonton. She has not experienced any difficulty in obtaining the necessary supplies.

Subject No. 10 states that she has "no problem" in giving herself a daily insulin injection. She does not believe that her vision is a problem. "I can see fine." The subject did not experience difficulty initially in giving her injections because "they taught me how to do it while I was in the hospital and there was always someone there to help me." She does not feel that the need for a daily insulin injection has changed her life. "I always get up early, even on weekends. I do fine." The subject has not noticed any specific activity or emotion which cause her insulin needs to change.

Reactions and Other Illnesses

The subject had experienced "a few" insulin reactions prior to attending the program at the metabolic centre but states that she has not experienced any reactions in the last six weeks. She is able to identify the onset of a reaction because she becomes weak, hungry and develops a headache. She knows what to do when a reaction occurs. "I take cookies and juice." The subject always carries Lifesavers in her purse. As she has not recently had a reaction in the presence of family members, she is unable to determine the effect on them. Subject No. 10 has not experienced any recent problems with her health.

Diet

Subject No. 10 states: "Diet is important because you have to watch the sugar you eat." She follows the same 1,500 calorie C.D.A. diet prescribed for her at the metabolic centre. The subject does her own meal planning and preparation. Meals are planned one day at a time. Foods are "usually" weighed, but the subject sometimes estimates food portions, especially when she eats away from home. Books and recipes given to her at the metabolic centre are used as the basis for planning her meals. Food costs have not changed. The only changes in food purchases which the subject notices are that she now buys sugar substitutes and more fresh fruits than previously. Her meal schedule has changed. She now eats three meals and five snacks instead of three meals and infrequent snacks. The subject follows the same routine on weekends as during the week.

When eating out, the subject finds it is sometimes hard to follow the diet plan. "I usually try to stay pretty close to the diet, but when I go out its hard to follow it exactly." The subject identifies eating out as the major difficulty in following a diabetic diet. Her weight has remained unchanged, and she has not spoken to a dietitian since coming home. She has seen her doctor once. "He said the blood tests were good so I must be doing okay."

Urine Testing

The subject tests her urine four times a day as instructed. Although she is not aware of the meaning of the term double-voided specimen, she states: "I always use the second urine to test." The results are recorded in her daily diary and shown to her physician. The subject does not adjust her own insulin dose. "The doctor does that." Urine testing is not a problem for the subject. "I just take all my stuff with me in my case when I go out."

Footcare

Subject No. 10 recognizes the importance of doing footcare daily. "You have to do it every day. If you got cuts or things, you could get gangrene." She soaks her feet daily and applies lanolin ointment. She cuts her toenails straight across. The subject states: "My feet are in good shape. If I get cuts or infections I'll see my doctor right away. I don't want foot troubles."

Exercise

Subject No. 10 recalls that she was told to exercise "twenty minutes a day regularily." Her level of activity has increased since attending the metabolic centre. Previously, her activity consisted of housework and gardening. She now goes for a walk "at least twice a week." The subject has not received instructions about exercise from her doctor. "I don't know why I don't exercise regularly. It just depends on how I feel."

Effects of the Disease

Subject No. 10 has noticed a significant change in her state of health. "I got sick so bad and had to go to the hospital. After that I wasn't feeling so good. My weight was up and my hands and feet were swelling. I feel real good now. I've got more energy and can do lots more things." The subject does not believe that being diabetic creates any major problems for her. "I have to do certain things like injections and urine tests and following a diet. But it's not so bad. I manage fine." She does not feel that diabetes has prevented her from doing what she wishes. "I still garden and visit my friends." Her relatives and friends are aware of the fact that she is an insulin-dependent diabetic. "My family worries about me but I tell them I'm doing fine." She has not noticed any reaction from her friends. The subject feels she is following directions well. "I do everything I'm supposed to. I want to take care of myself."

Reactions to the Education Experience

Subject No. 10 learned about diabetes and the care it requires from several sources including her doctor, her daughter-in-law, books and classes at the metabolic centre. She found the four-day program at the metabolic centre to be "real good because it taught me a lot I didn't know before about diet and insulin and other things I should know." The subject received some explanations from her personal physician. "He didn't really tell me much. Mostly he told me to follow my diet." She has seen her physician every week since completing the education program. "He tells me I'm doing good." The subject learned "lots" from the nurse. "She taught me all about urine tests and exercise and how to give insulin." The dietitians were helpful. "I learned how to plan good meals, I understand it well."

The subject identifies her daughter-in-law and the staff at the metabolic centre as the people who most helped her in learning to care for herself. She does not have any concerns or suggestions about the education program. If she has questions about diabetes she says that she will call her own doctor or the doctor at the metabolic centre. She expresses her current feelings about having diabetes: "It's okay. I'm not ashamed. I'm managing fine and trying to watch my diet."

Summary

The subject demonstrates a good understanding of the characteristics of diabetes and the care it requires. Her level of knowledge, as reflected in the tests of knowledge, has increased in six weeks since completing the education program. Some changes have occurred in the accuracy with which the subject carries out procedures related to her care. Her accuracy in drawing up her insulin has decreased. She does not use the magnifier to assist her in the procedure. She does not appear to believe this is a problem in spite of the fact that the inaccuracy was brought to her attention. Also, the subject does not use a watch to time the urine tests at home although she did so at the metabolic centre. The subject follows the footcare procedure correctly.

Subject No. 10 completely complies with three aspects of her prescribed therapeutic regimen and partially complies with the others. She performs footcare daily as instructed. She also complies with the urine testing aspect of her regimen. In spite of the fact that she does not time the procedure correctly, she tests her urines at the designated times and records the results. The subject takes her insulin daily as prescribed. Again, her accuracy in carrying out this procedure is not reliable because of problems with her vision.

The subject does not always comply with her prescribed diet. She follows it "most of the time" but finds that she encounters difficulties when she eats out. Exercise is another area in which the subject partially complies. She goes for a walk twice a week even though she knows she was told to exercise for twenty minutes daily.

The subject's desire to remain independent is a major motivation for the subject to comply with her prescribed therapeutic regimen. She is determined to care for herself and realizes that she must maintain her health to do so. There is a disparity between how well the subject actually follows her prescribed regimen and how well she perceives she is following it. Subject No. 10 believes that she is following instructions completely and accurately. She is encouraged by the feedback she has received from her personal physician in terms of the results of her blood sugar tests and the lack of insulin reactions. She is very reluctant to accept any assistance in her home and reacts negatively to the idea of a public health nurse coming to visit her.

The subject is positive about the education experience. She believes it has been very helpful for her. Subject No. 10 has no suggestions for changes or improvements and would not hestitate to contact the staff at the centre if she thought she needed their assistance.

CHAPTER V

FINDINGS OF THE STUDY: THE ADULT GROUP

In the previous chapter, the findings of the study were presented in detail in the form of individual case studies. In this chapter, the findings of the study are summarized in terms of the adult group. The information is presented in eight sections: (1) significant characteristics of the group, (2) results of the tests of knowledge, (3) skills performance, (4) subjects' compliance with their therapeutic regimens, (5) problems encountered in following the prescribed regimens, (6) reactions to the education programs, (7) discussion of the findings, and (8) additional findings.

I. SIGNIFICANT CHARACTERISTICS OF THE GROUP

An examination of the characteristics of the sample group, as presented in Table XVIII, reflects the diversity of its members. Five of the subjects are male and five are female. They range in age from 31 years to 73 years with a mean age of 53.9 years. Seven of the subjects are married, two are widowed and one is divorced. The educational level of the subjects ranges from grade five to completed university degrees. Two subjects have completed high school and have taken other training, and two subjects have completed university degree courses. Three of the subjects are homemakers, one is retired, and the remaining six subjects occupy full time jobs.

TABLE XVIII

Significant Characteristics of the Sample Group

Subject	Sex	Age	Marital Status	Educational Level	Occupation	Type of Treatment	Education Program	Previous Diagnosis	Accompanied to Program By Relative
1	M	48	D	Grade 5	Salesman	Diet only	Hospital	Yes	No
2	F	53	M	Grade 12 + Secretarial Training	Secretary Manager	Insulin and diet	Hospital	Yes	No
3	F	73	M	Grade 7	Homemaker	Diet only	Hospital	No	No
4	M	61	M	University Degree	Security Guard	Insulin and diet	Hospital	Yes	Yes
5	F	46	M	Grade 5	Daycare Worker	Insulin and diet	Metabolic Centre	No	Yes
6	M	31	M	Grade 12 and Technical Training	Heavy-Duty Mechanic	Insulin and diet	Metabolic Centre	No	Yes
7	F	51	M	Grade 8	Homemaker	Oral hypoglycemic and diet	Metabolic Centre	No	Yes
8	M	41	W	University degree	Engineer	Oral hypoglycemic and diet	Metabolic Centre	No	No
9	M	65	M	Grade 5	Retired	Insulin and diet	Metabolic Centre	Yes	Yes
10	F	70	W	Grade 8	Homemaker	Insulin and diet	Metabolic Centre	Yes	Yes

In terms of treatment for diabetes, six of the subjects are controlled by insulin and diet, two are controlled by oral hypoglycemics and diet, and two are controlled by diet alone. Four subjects attended classes at the hospital, and six subjects attended the program at the metabolic centre. Five of the ten members of the group had been told previously that they had diabetes but had never attended a diabetes education program. Six subjects were accompanied by relatives to the education program, and four were not. From this discussion of significant characteristics of the subjects in the sample, it can be seen that the group is composed of individuals who are heterogeneous in terms of their sociological characteristics as well as factors relating to their disease status.

II. KNOWLEDGE PERFORMANCE

Three tests were used to assess the subjects' level of knowledge at three points in time: a pretest administered prior to the education program; a posttest administered at the completion of the education program; and a follow-up posttest administered at the interview conducted between six and thirteen weeks after completion of the education program. The results of the tests of knowledge are presented in Table XIX. As each subject's performance on the three tests of knowledge has been discussed in detail in the individual case studies in Chapter IV, this section focusses on obvious trends and patterns of response.

TABLE XIX

Performance in Percent Scores for Adult Sample on Three Tests of Knowledge

Subject	Pretest %	Posttest %	Follow-up Posttest %
1	70	69	71.4
2	85	85.7	80.9
3	-	71.4	59.5
4	-	69	69
5	70	83.3	76.2
6	40	92.8	92.8
7	55	80.9	85.7
8	60	66.6	83.3
9	-	61.9	73.8
10	70	80.9	88
$\overline{X}$	64.2	76.1	78

The Pretest

Seven of the ten subjects completed the pretest. Response to Part A of the pretest revealed that most of the subjects had a very superficial understanding of diabetes. All recognized that diabetes involves a problem with sugar, but only four subjects (2, 6, 7, 10) demonstrated a greater understanding of the pathophysiology of the disorder. Subject No. 2 had done extensive reading and displayed a high level of understanding about the disease.

Responses to Part B of the pretest showed that with the exception of Subject No. 6, all of the subjects were acquainted with individuals with diabetes. Six of the subjects have relatives with diabetes. Subject No. 1 expressed concern because the diabetic person he knew had required an amputation. Two subjects (5, 8) expressed concern about injections. In both cases, their mothers were diabetic and required daily insulin injections. The subjects were fearful about this aspect of diabetes.

The pretest scores demonstrate a wide variation in the knowledge of subjects about diabetes. The scores range from 40 percent to 70 percent with a mean of 64.3 percent. Examination of the subjects' responses shows that all were able to identify some characteristics of the diseases. Most subjects were able to correctly answer some questions in all areas.

The Posttest

At the conclusion of their education program, all ten subjects completed the knowledge posttest. The results, presented in Table XIX, range from 61.9 percent to 92.8 percent with a mean of 76.1 percent. Subjects had more difficulty in answering the comprehensive questions contained in Part B of the postest than the more simple knowledge questions contained in Part A. Examination of individual responses outlined in each case study reveals some common patterns of responses. Most subjects were able to correctly answer the majority of questions concerning characteristics of the disease, urine testing, footcare, exercise and general health practices. They had more difficulty in answering questions about medications and diet, particularly those testing the understanding of the interrelationships of these aspects of control. In this regard, questions concerning exercise also presented difficulty. Subjects' answers to the questions concerning complications reveal the most consistent response. Nine of the ten subjects were unable to correctly answer the questions asking them to identify and differentiate the symptoms of hyperglycemia and hypoglycemia.

The Follow-up Posttest

All ten subjects completed the follow-up posttest of knowledge. The results of this test are presented in Table XIX. The scores range from 59.5 percent to 92.8 percent with a mean of 78 percent. The patterns of response in the test are less clearly differentiated. When compared with the posttest results, the scores of five subjects (1, 7, 8, 9, 10) increased, three (2, 3, 5) decreased and two (4, 6) remained the same. Again, Part B questions concerning diet, medications and complications seemed to present more difficulty for subjects. However, some subjects, such as Subject No. 5, correctly identified fewer characteristics of the disease, but correctly answered more questions dealing with medication and diet.

Four of the six insulin-dependent diabetics (5, 6, 9, 10) were able to more clearly identify and differentiate the symptoms of hyperglycemia and hypoglycemia. The two subjects on oral hypoglycemic medications (7, 8) correctly answered more questions concerning diet.

III. SKILLS PERFORMANCE

Each subject's ability to perform skills necessary in following his or her prescribed therapeutic regimen was assessed twice. The initial observation was made at the conclusion of the education program. The second observation was conducted during the course of the follow-up visit to each subject's home.

Preparation and Administration of Insulin

Six of the ten subjects (2, 4, 5, 6, 9, 10) require daily injections of insulin. Five subjects were willing to draw up and administer their own insulin and one was not. Subject No. 9 refused to give himself injections. After much persuasion he did draw up the insulin on one occasion but refused to inject himself. In this instance his wife, who had been taught to perform the procedure was observed. She drew up and administered the insulin correctly and experienced no difficulty in following the correct procedure.

On initial observation of the remaining five subjects, all were able to draw up and administer the insulin. Some uncertainty was observed. Subject No. 5 experienced confusion over the dosages but sought confirmation with the nurse. Both Subjects No. 5 and 10 experienced difficulty in seeing the markings on the syringes. Subject No. 10 required a magnifier to enable her to see the markings. Subject No. 2 did not palpate the injection site. Neither Subject No. 2 or Subject No. 4 inspected the site for atrophy. Both stated they were unaware of this step.

On the follow-up assessment, it was found that three subjects demonstrated decreased proficiency in this procedure. Subject No. 2 did not observe a large air bubble in the syringe. She contaminated her equipment twice without noticing, and did not palpate or inspect the injection site. Following the injection she rubbed the site vigorously.

Subject No. 4 did not check the bottom of the insulin vial to ensure that the insulin was mixed. He reversed the order for injecting air into the vials. He also neglected to palpate and inspect the injection site, and when finished, he too rubbed the injection site.

Subject No. 10 followed the correct procedure for drawing up the insulin, however she made dosage errors for both types of insulin. She drew up two units too much of both insulins. At the same time, she did not notice the presence of two large air bubbles. It was noted that she did not use the magnifier when performing the procedure.

The remaining two subjects and Subject No. 9's wife carried out the procedure accurately. In fact, their levels of confidence had increased.

Preparation and Administration of Oral Hypoglycemics

On initial observation, the two subjects taking oral hypoglycemics (7, 8) were able to identify the correct name, dose, time, purpose, and peak time of action of their oral hypoglycemic medications. Each measured out and took the correct dose. At the follow-up interviews, both subjects followed the correct procedures but neither subject was able to recall the peak time of action of the medications.

Urine Testing

On initial assessment, all ten subjects were able to test their urine specimens correctly and interpret the results accurately. On follow-up assessment, seven of the ten subjects performed the procedure correctly, but three subjects (1, 7, 10) did not time the procedure accurately. Rather than timing the procedure with a watch, each of the three individuals counted off the seconds. All three believed that they had performed the procedure accurately and were surprised when the discrepancy was pointed out following completion of the procedure. Subject No. 7 said she was unaware of the fact that inaccurate timing could distort the results of the test. All three subjects interpreted the results accurately.

Footcare

Due to a lack of facilities in which subjects could perform footcare, only three subjects were observed performing the procedure. The remaining subjects were asked to outline the procedure they would follow at home. All ten subjects outlined the correct procedure for performing footcare on initial observation. Eight of the ten subjects outlined the correct procedure. Two subjects (3, 4) were not aware of the need to periodically check the insides of their shoes for rough edges.

IV. COMPLIANCE WITH THE PRESCRIBED THERAPEUTIC REGIMEN

In this section, the extent to which the members of the sample comply with the selected aspects of their prescribed therapeutic regimen is examined. The five selected aspects of treatment are: (1) medications, (2) diet, (3) urine testing, (4) footcare, and (5) exercise. In order to make comparisons among the subjects, it is necessary to classify their behaviours. The behaviours of the subjects are classified into three categories: (1) complete compliance, (2) partial compliance, and (3) noncompliance. A subject is said to be completely complying with an aspect of his regimen when he successfully incorporates the selected treatment into his daily routine. Partial compliance refers to the situation in which the subject does not consistently carry out the treatment as part of his daily routine. Noncompliance is the lack of any attempt to carry out the prescribed treatment. It must be remembered that to some extent classification of behaviours into these categories involves subjective judgement and may appear somewhat arbitrary. However, this is an unavoidable problem when allocating human behaviours to artifical categories. The extent to which each subject complies with selected aspects of the therapeutic regimen is represented in Figure 1.

Medications

Four of the six insulin-dependent subjects (2, 5, 6, 10) completely comply with this treatment. The subjects noted that performing this procedure required an initial adjustment in their daily routines. At first, it took some time to prepare and give the injection and initially

Subject	Medication	Diet	Urine Testing	Footcare	Exercise
1	N/A	N	P	C	N
2	C	P	C	C	P
3	N/A	N	P	P	N
4	P	C	P	P	C
5	C	P	C	P	N
6	C	C	C	C	C
7	C	P	C	P	N
8	C	C	C	C	C
9	P	P	C	C	P
10	C	P	C	C	P

C	Completely Complies
P	Partially Complies
N	Noncompliance
N/A	Not Applicable

Figure 1

Extent of Subjects' Compliance With Five Aspects of Their Prescribed Therapeutic Regimens confidence was poor. They all feel that they are now managing well with their daily injections.

Two subjects (4, 9) partially comply with the daily insulin injection. Subject No. 4 refuses to rotate injection sites to the abdomen as he is afraid of hitting a vital structure. Although capable of preparing and administering the insulin, he very seldom does so. His wife does this procedure for him. He does not give a reason for not performing the procedure himself. Subject No. 9 has a strongly ingrained fear of injections and refuses to prepare and administer his own injection. He will permit others to give him his daily insulin injection; therefore, his wife does it for him.

Two subjects (7, 8) receive oral hypoglycemic therapy. Both subjects completely comply with this aspect of their regimens. Neither subject expresses concerns about preparing or taking the prescribed medication. When asked, both subjects said that they did not have any difficulty in adopting this procedure into their daily routines.

Diet

Only four of the ten subjects (4, 6, 8, 9) completely adhere to their prescribed diets. Subjects No. 4 and 6 believe diet is important in maintaining good health. Subject No. 8 was initially motivated by fear that he would require insulin injections, but now he follows the diet because he has been told that there is a possibility that he can stop taking oral hypoglycemics if he loses the required amount of weight. Subject No. 9 is motivated to follow his diet because of his desire to regain his strength.

Those subjects who partially comply with their diets include Subjects No. 2, 5, 7 and 10. Subject No. 2 wishes to lose weight and as a consequence sometimes misses meals and snacks or eats less than the prescribed amount. Subjects No. 5, 7 and 10 know that diet is important but find it difficult to strictly adhere to their diets, especially when eating out.

Subjects No. 1 and 3 do not comply with the dietary aspects of their regimens. Subject No. 1 refuses to restrict his food intake. He believes his health is fine, and as he has lost five pounds, sees no need to follow a diet. Subject No. 3 knows that she should follow a diet but says she doesn't know enough about it. She also says that her priority at present is her husband's health and she will think about herself later.

Urine Testing

Six of the subjects (2, 5, 6, 7, 8, 10) consistently carry out this procedure as instructed. They test their urines the prescribed number of times and at the assigned times, whether they are at home or elsewhere. None of these subjects feel that performing this procedure creates problems for them.

The remaining four subjects (1, 3, 5, 9) partially comply with this aspect of their regimens. Subjects No. 1, 4 and 9 test their urines at least twice a day; however, they do not perform the procedure when they are away from their homes. Inconvenience and lack of facilities at work are the reasons given for failure to carry out the procedure as frequently as instructed. Subject No. 3 tests her urines inconsistently. She does it when she remembers but not necessarily every day. She refuses to test her urine when she is away from home and questions the necessity for continuing to test them as the results are always negative.

Footcare

Six subjects (1, 2, 6, 8, 9, 10) perform footcare daily. Subject No. 1 is particularly careful to perform footcare every day. He is motivated by fear of amputation. Subject No. 2 is aware of the importance of footcare as she has had problems with an infected foot. The other subjects carry out the procedure because they believe that care of the feet is important to prevent infections.

The remaining four subjects manifest their partial compliance in varying ways. Subject No. 3 does footcare only occasionally as she finds it inconvenient to do it more often. Subject No. 4 gives conflicting information about how often he does the procedure. Subject No. 5 soaks her feet once a week. She frequently goes barefoot and wears plastic shoes which she was told by the doctor were unhealthy. Subject No. 7 does the footcare procedure daily but goes barefoot both in the house and in the garden in spite of the fact she knows she shouldn't.

Exercise

Four subjects (4, 6, 8, 9) exercise daily. Subjects No. 4, 6 and 8 do so because they believe exercise is beneficial and helps them to feel better. Subject No. 9 does so because he was told that exercise would help him to regain his strength and recuperate from the weakening effects of his illness and surgery.

Subjects No. 2 and 10 partially comply. Subject No. 2 acknowledges the importance of exercise but finds that the effects of her prolonged illness limits her capacity to do so. Subject No. 10 exercises about once a week. She is unable to give a reason for not doing so more frequently.

Four subjects (1, 3, 5, 7) do not comply with this aspect of their regimen. Subjects No. 1 and 5 say that they receive sufficient exercise during the performance of their jobs. Subject No. 3 does not give a reason for not exercising. Subject No. 7 knows that she should exercise. She has an exercise bike which she does not use. When asked why, she said that she was just lazy. It seems that none of these subjects are convinced that following a regular exercise program will have a significant impact on their health.

V. PROBLEMS IN FOLLOWING THE PRESCRIBED THERAPEUTIC REGIMEN

At the follow-up interview, subjects were asked to describe any problems they encountered in following their prescribed therapeutic regimens. Only two subjects (1, 10) stated that they did not encounter any problems in following their regimens.

Difficulty in following the diet was by far the most common problem identified. Six subjects (2, 3, 5, 6, 7, 8) described problems with this aspect of their regimens. Concerns included: lack of knowledge about the diet; the need for willpower in following the diet and when shopping for food; and problems with other people not understanding the need for diabetics to control the food they eat.

Insulin injections were of concern for three subjects (2, 5, 9). Subjects No. 2 and 5 had trouble at first in seeing the markings on the insulin syringes because of blurred vision. Subject No. 9 found that adjusting to daily injections was the major problem which he experienced.

Subject No. 2 found that when she had a severe insulin reaction, she did not know what to do and required professional assistance.

Psychological concerns were the major difficulty for Subject No. 4. He found that being diabetic was a handicap when applying for jobs. He also believed that diabetes had affected his sexuality and was unsure of what to do or whom to talk to about the problem.

VI. REACTIONS TO THE EDUCATIONAL EXPERIENCE

At the follow-up interview, each subject was asked a series of questions designed to elicit reactions to the educational experience. As well, each subject was asked if he or she had any suggestions about how the educational experience could be improved.

All ten subjects expressed positive reactions about the education programs. They commented on the importance of classes in teaching them what diabetes is and what they should do to care for themselves. Several of the subjects (3, 5, 6, 7, 8) mentioned that they were either scared or apprehensive initially. These feelings were related both to the diagnosis of diabetes and the uncertainty of being able to learn all that was necessary so that they could care for themselves.

Some of the subjects expressed specific fears. Subject No. 5, whose mother had been an insulin-dependent diabetic, was very unsure of her ability to give herself injections. Subject No. 9 expressed a strong fear of needles. At first, he did not appear to be convinced of the necessity of injections. By the conclusion of the education program, the fears of both individuals were allayed. Subject No. 5 was able to administer insulin safely. Subject No. 9, while refusing to give himself injections, seemed to accept the need for this aspect of therapy and allowed his wife and daughter to perform this procedure.

Two subjects (1, 8) initially displayed negative reactions to attending the education programs. Subject No. 1 did not think that the classes would be helpful to him as he was not on insulin. At the follow-up interview, the subject said that he found the lectures helpful in teaching him why he should test his urines and do footcare. Subject No. 8, whose mother was an insulin-dependent diabetic, appeared quite upset and hostile during his first day at the metabolic centre. He later explained that he was upset and scared at first because he had learned the negative aspects of being diabetic from his mother. At the follow-up interview, Subject No. 8 was very positive about the education program. He felt the program had taught him much useful information about how to care for himself.

Subjects were asked to identify what they had learned from various personnel involved in teaching them about diabetes. While some were unable to differentiate among the people involved in teaching them about diabetes, most were able to identify which people taught them about the various facets of their care. The physicians were most commonly identified as the individuals who provided explanations about diabetes and the changes associated with the disease. Physicians were also seen as the information source for such concerns as adjustments in insulin dosages and changes in medications. Only one subject stated she had not learned much from her doctor. The teaching nurses were identifed as the persons who taught the subjects how to care for themselves. Learning to give injections, testing urines, and general measures of care were the areas identified as being taught by the nurses. The nurse also provided explanations about diabetes and the care it requires. The dietitians were described as the individuals who taught about diabetic diets and provided information about how to manage the diets at home.

When asked to identify the one individual who was most helpful in assisting them to learn to care for their diabeties, six of the subjects (1, 2, 3, 7, 8, 9) mentioned the diabetes teaching nurse as the most helpful individual. Subjects No. 1 and 2 felt that the nurses on the hospital units also aided them in learning about what they had to do. Subject No. 5 identified her home-town physician as the person who helped her most in understanding the care and providing support when problems arose. Two subjects identified relatives as being the most helpful individuals. Subject No. 6 named his wife, and Subject No. 10 identified her daughter-in-law. Only Subject No. 4 did not identify one individual. He said that all the people he encountered were helpful.

Several of the subjects (2, 4, 5, 7, 9) mentioned that their family members were very helpful and supportive. The wives of Subjects No. 4 and 9 give them their daily injections. Their wives also assumed total responsibility for meal planning and preparation. The husband and son of Subject No. 2 both learned to give injections and have done so when she was ill. They also reminded her to test her urines and eat her meals and snacks on time. The daughter of Subject No. 7 drew up a daily schedule for meals, snacks, and urine tests as well as a schedule for doctor's visits and blood tests to help her mother follow her prescribed therapeutic regimen.

When asked what suggestions they had to improve their education experiences, five subjects offered some ideas, and five subjects said they did not have any suggestions. Subject No. 2 believed that it was important that all diabetics be aware of what can happen to them if they do not follow their prescribed regimens. She also suggested the need for public awareness programs so that more people would understand about diabetes. Subject No. 3 suggested the need for more information about diet as part of the classes. A desire for more information about the psychological adjustments to diabetes was expressed by Subject No. 4. He felt that that more attention should be paid to teaching people how to adjust to the changes they will experience when they go home. A similar suggestion was offered by Subject No. 6. He believed that a section dealing with the emotional aspects of being diabetic would be very helpful. He also suggested the need for a longer lunch break between classes at the metabolic centre. In his opinion, with so much material to learn a longer break was needed so that people could get away for a while and absorb what was happening. Although Subject No. 7 did not have any suggestions regarding the content of the education program, she felt that the timing of an individual's attendance at the program should be considered. She suggested that it is important to have time to adjust to the disease before being presented with all the information to be learned.

VII. DISCUSSION

Characteristics of Subjects

The wide variation among subjects in terms of socio-demographic and disease-related characteristics such as educational background, the primary mode of treatment, and length of time the subject has had diabetes, suggests that the ability of the subject to learn the required material will vary. The responses of subjects when asked to describe what diabetes meant to them and what they had learned from other diabetics suggests that the level of knowledge with which individuals enter the program also varies. These findings, which are reflected in the patient education literature indicate the need for flexibility in instructional content and methods.

Knowledge Performance

The results of the knowledge pretest and posttest demonstrate that subject's knowledge levels do increase as a consequence of the teaching they receive. The difficulties encountered in answering the comprehensive questions, particularly those concerning the interrelationships among aspects of control and complications of diabetes suggest the need for an examination of ways to facilitate learning in these areas.

An inconsistent pattern is reflected in the follow-up posttest scores with some increasing, some decreasing and some remaining the same. Hulka et. al. (1975) postulate that in some cases, diabetics learn from their disease. It is interesting to note that three of the five subjects whose scores increased are insulin-dependent. This is also in accordance with the conclusions of Hulka et. al. (1975) who suggest that insulin-dependent diabetics may be more receptive to learning due to the daily reminder of an insulin injection. Of the three subjects whose scores decreased, one has been ill and has not had the opportunity to assume much responsibility for her own care. It is possible that this may be a factor in the decreased score. Another subject has not had any medical follow-up and has not yet received her individual diet counselling. The remaining subject appears to be managing well with her care. Kirscht and Rosenstock (1979) have suggested that people do not have to have extensive knowledge about their disease as long as they know enough to follow their prescribed regimens.

Skills Performance

Skills performance assessments indicate that by the end of the education program all of the subjects had mastered the necessary knowledge and skills to carry out the selected aspects of their prescribed therapeutic regimens. By the time of the follow-up visits (between six and thirteen weeks after completion of the education program) decreased proficiency was observed in some subjects. Three subjects displayed decreased accuracy in the preparation and administration of insulin. Three subjects demonstrated decreased accuracy in testing their urines. This is similar to the findings of Watkins et. al. (1967a) in their study of diabetic knowledge, management and control, and Watkins et. al. (1967b) in their study of the accuracy of medication administration among diabetics. In both those studies, the subjects had been diabetic for over a year or more. Two subjects taking oral hypoglycemic medications were unable to identify the peak time of action of their drugs, and two subjects did not recall the need to periodically check the insides of their shoes as part of care of the feet. The inability of the subjects to accurately recall this material, which was presented in class, is compatible with the results of the study by Hulka et. al. (1975) who found that patients recalled only two-thirds of the information communicated by them by physicians after a two-week period. The increased confidence in giving injections by some of the subjects also tends to support the supposition that some diabetics learn from their disease (Hulka et. al., 1975).

Compliance With the Prescribed Therapeutic Regimen

With the exception of one subject, all of the individuals in the sample expressed reasons why it was important for them to follow their prescribed regimens. Subject No. 1 stated a willingness to comply with only one aspect of treatment. These reasons are summarized in Figure 2. In spite of their expressed motivations, all but two of the subjects failed to completely comply with one or more aspects of their prescribed regimens.

Diet and exercise are the two aspects of treatment with which there is the least compliance among the subjects. It is not surprising that subjects do not comply well with diet. West (1973:42) states: "A review of the available evidence shows clearly the rarity with which diabetics understand and follow their diet prescriptions." Subjects gave a variety of reasons for failing to completely comply, but in only one case was

Subject	Expressed Motivation for Complying
1	Did not express a general motivation. Motivated to perform footcare because of fear of amputation.
2	Believes if she keeps diabetes under control, other health problems will subside.
3	Wants to maintain her independence.
4	Wants to maintain good physical health.
5	Wants to stay healthy. Does not want to have same problems as her mother.
6	Wants to stay healthy. Believes it is very important for both his family and himself.
7	Members of family very short-lived. Wants to remain healthy in order to live longer.
8	Wants to stay healthy. Wants to avoid need for injections and eventually come off oral hypoglycemics.
9	Wants to regain strength and recover from effects of surgery.
10	Wants to remain healthy and independent.

Figure 2

Subjects' Expressed Motivations for Complying
With Prescribed Therapeutic Regimens

lack of knowledge the reason given. Difficulty in adhering to the diet and lack of willpower were the major reasons given. Following a diabetic diet involves changing old behaviours. Haynes et. al. (1979) have noted that altering old behaviours is more difficult that adding new ones.

The failure of subjects to exercise regularly seems to be related to beliefs about the value of exercise. The subjects who completely comply believe strongly in the value of exercise as do those subjects who partially comply. However, most of the subjects who fail to comply with this aspect of treatment do not appear to be convinced of its value. This finding is in accordance with Mainman et. al (1977:216) who, in describing the Health Belief Model, postulate that one of the essential elements in determining compliance is the subject's belief in the potential benefits. Inconvenience and a lack of belief in the importance of the procedure seem to be the main reasons for failure to perform footcare regularly. In the case of one subject, fear of amputation is the major factor motivating him to perform the procedure regularly.

Inconvenience is also the reason given by subjects for failing to test urines as frequently as prescribed. Some subjects do not like to do it outside of the home. One subject questioned the value of the procedure as her tests are always negative. These findings are also consistent with the theory of the Health Belief Model (Mainman et. al., 1977).

Compliance was greatest in the area of medications. Although two subjects did not give themselves the injections, their wives performed this procedure for them with the result that all subjects received their medication daily as prescribed. All of the subjects acknowledged the importance of medications in the treatment of diabetes.

Knowledge, or lack of it, does not appear to be a major factor in explaining the failure of patients to comply with their regimens. It was given as a reason by only one subject to explain her failure to comply with the diabetic diet. The findings of the study in terms of the relationship between knowledge and compliance is illustrated in Figure 3. The extent of the subject's compliance with the five aspects of the their therapeutic regimens is compared with the subjects' scores on the follow-up test of knowledge. The scores are ranked in descending order. The person with the highest score on the posttest also has the greatest compliance with his therapeutic regimen and the person with the lowest score has the least compliance. However, the pattern is not consistenty followed in the remaining subjects. Some of the subjects with lower scores comply more than do some of the subjects with higher scores. This finding is compatable with the views expressed in the literature that knowledge is not the most important determinant of compliance (Hogue, 1978; Marston, 1970; Sackett & Haynes, 1975).

Reactions to the Educational Experience

The reactions to the educational experience indicate that subjects feel it is important to know what to do to care for themselves. As well, it is important for them to believe they will be able to care for themselves at home. In this respect, support and reassurance as well as knowledge are important to the subjects. The support of relatives is also important in helping subjects to comply with their regimens and adjust to the changes in their lives. Hogue (1979) believes that helping the patient to feel competent to manage his regimen and utilizing the

	Aspect of Regimen				
Subject	Medication	Diet	Urine Testing	Footcare	Exercise
6	C	C	C	C	C
10	C	P	C	C	P
7	C	P	C	P	N
8	C	C	C	C	C
2	C	P	C	C	P
5	C	P	C	P	N
9	P	C	P	C	C
1	N/A	N	P	C	N
4	P	C	P	P	C
3	N/A	N	P	P	N

C	Completely Complies
P	Partially Complies
N	Noncompliance
N/A	Not Applicable

Figure 3

Extent of Subjects' Compliance With Five Aspects of Prescribed Therapeutic Regimen Ranked in Descending Order According to Follow-up Posttest Score patient's natural support systems are two ways in which compliance can be improved.

VIII. ADDITIONAL FINDINGS

The information collected in this study resulted in two findings which were not directly related to the topic being investigated. The first finding concerns the knowledge levels of patients in relation to relatives who accompany them to the education program. The second finding concerns the reactions of the subjects to the follow-up interview.

Knowledge of Relatives

Due to the fact that classes at the metabolic centre started before subjects could be selected, permission was given to administer the pretest and posttest to all individuals attending the education program during one week of the data-collection phase. The people who wrote the pretest and posttest included all diabetics in attendance and all the relatives who accompanied them. The group included young people and adults as well as new diabetics and those back for review. The tests were marked, converted to percentages and the mean scores determined. The means of both tests of knowledge for patients and relatives is presented in Table XX. The diabetics achieved a higher mean score than relatives on the pretest. However, the relatives achieved a higher mean on the posttest .

It is not unexpected that the diabetic patients achieved a higher pretest mean as the group included new diabetes as well as those who had returned to the centre for review and control of their illness. A

TABLE XX

Comparison of Patients' and Relatives' Knowledge Pretest and Posttest Means in Percent

	Pretest		Posttest	
Group	N	$\overline{X}$	N	$\overline{X}$
Patients	13	67.7	12	79.9
Relatives	8	64.3	10	84.2

suggested reason for the lower posttest score is that the diabetics, who are at the centre for control, have higher than normal blood sugars which may interfere with intellectual functioning. As well, some of the new diabetics may have been in the process of adjusting to their illness. If this is so, then their thoughts were likely focussed in other directions.

The small numbers and the nonrandom nature of the participants do not permit generalization of these findings. However, the results do lend support to the concept of the importance of including relatives or significant others in the education process (Etzweiler, 1973; Hogue, 1978; Redman, 1975).

Reactions to the Follow-Up Visit

All ten subjects expressed very positive reactions to the investigator during the follow-up visits. The subjects were aware that the visits were made as part of a thesis study and that the investigator was not part of the hospital or metabolic centre staff. Comments made by the subjects include: "I'm glad to have someone come and see how I'm doing"; "I'm really glad to be able to ask someone about this"; and "It's so nice to know that someone cares". Some subjects asked for advice. Others sought confirmation that what they were doing was correct. The surprising aspect of this finding is that, with the exception of two individuals, all of the subjects had been in contact with health professionals. Some had seen or talked to their physicians on a regular basis. Others had returned to the metabolic centre for review. One subject was visited regularly by the public health nurse.

The reactions of the subjects suggest that there is a perceived need for active follow-up on the part of those involved in the education programs. Diabetic individuals are expected to assume responsibility for their own care. They are told they can return to the hospital or metabolic centre and/or can phone for advice and assistance. Subjects are strongly urged to return to the metabolic centre for review. In spite of these resources, the subjects seem to require the reassurance of a visit to their homes.

It is possible that this is a feeling related to the length of time an individual has been diabetic. All of these subjects were either newly-diagnosed or undergoing education for the first time. It would be interesting to determine if this perceived need lessened as time passed and subjects became more adapted to their condition.

SUMMARY

In this chapter, the findings of the study as they relate to the subjects as a group have been examined. A review of the significiant characteristics of the subjects reveals the diverse nature of members of the group. The pretest scores indicate that initially subjects have varying degrees of knowledge about diabetes and the care it requires. The posttest scores indicate an increase in knowledge at the conclusion of the education program. Areas of difficulty in subjects' response patterns are revealed. The follow-up posttest scores show that on follow-up, the knowledge levels of some indivdiuals increase, some decrease, and some remain the same. Assessments of skills performance reveal that some subjects develop increased confidence in areas such as insulin administration but others show decreased proficiency in the performance of selected skills. The extent to which patients comply with aspects of their regimens and the reasons for complying or not complying vary among the subjects. Knowledge does not appear to be the major determinant in compliance. Problems associated with compliance include both general and specific concerns. The reactions of subjects to the education program are positive, but some suggestions for improvement are offered. Additional findings include that in a comparison of pretest and posttest mean scores on one occasion, the relatives of patients, though achieving a lower pretest score, achieved a higher posttest result. The positive reactions of subjects to the follow-up interview are noted.

CHAPTER VI

SUMMARY, CONCLUSIONS, IMPLICATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

This chapter contains a summary of the study including the problem, the methodology and a review of the findings. Based on the findings, the conclusion of the study are presented. Implications are discussed. The final section contains the suggestions for further research.

I. SUMMARY

The Problem

The purpose of this study was to explore the relationship between knowledge and short-term compliance in ten patients newly-diagnosed with Diabetes Mellitus. Four exploratory questions were developed:

1. What teaching do patients receive during their initial education?
2. What knowledge and performance levels regarding the prescribed therapeutic regimen are demonstrated by patients immediately upon completion of the education program?
3. What knowledge and performance levels regarding the prescribed therapeutic regimen are demonstrated by patients six weeks after completion of the education program?
4. What problems do patients encounter in following their prescribed therapeutic regimens during the six weeks after completion of the education program?

Methodology

The sample was composed of ten individuals with diabetes who were attending education programs for the first time. Subjects were selected from the hospital education program and a metabolic centre education program. All subjects volunteered to participate in the study.

The data was collected in two phases. During the initial phase, a pretest of knowledge was administered to subjects before they commenced the education program. Subjects were observed for at least one-half of the time they were in class in order to gain information about their reactions. At the conclusion of the education program, a posttest of knowledge was administered. Subjects were asked to demonstrate skills incorporated as part of their prescribed therapeutic regimens. The selected skills include: (1) the preparation and administration of insulin or oral hypoglycemics; (2) the testing of urines; and (3) diabetic footcare. Skills checklists were used to assess the subjects' skills performances.

Phase Two of the study consisted of a follow-up visit to each of the subjects between six and thirteen weeks after completion of the education program. Knowledge levels were assessed by means of a follow-up posttest which was equivalent to the posttest administered at the completion of the education program. The ability of each subject to perform the selected skills was again assessed. An interview, designed to elicit information about both the extent of compliance with the therapeutic regimen and problems encountered in following it, was also conducted.

The information was analyzed in two ways. Individual case studies were developed which examined the knowledge, skills and compliance behaviours of each subject in detail. The data were then analyzed for the sample as a group.

Review of the Findings

The findings of the study, which have been discussed in detail in Chapters Four and Five, are summarized according to the four research questions.

Question 1: What teaching do patients receive during their initial education?

Examination of the hospital teaching outline (contained in Appendix B) and the metabolic centre teaching outline (contained in Appendix C) shows that both programs provide instruction in a wide range of topics related to diabetes and the care it requires. Major areas of emphasis include causes of diabetes and the effects on the body, medications, diet, urine testing, blood glucose determinations, and general health practices. In other words, diabetic individuals are provided with information to help them understand what is happening to them and what they must do to care for themselves. The material presented is not limited to information concerning the therapeutic regimen. Topics such as day-to-day problems, what to do during illness, adjustments for travelling, and safety precautions are also included.

Skills acquisition is an integral part of both programs. Such skills are insulin and oral hypoglycemic administration, blood glucose determinations and various methods of testing urine are also incorporated.

The ability of diabetics to adjust to, and cope with, changes associated with the disease is emphasized. Helpful pamphlets and other literature is made available. The purposes and functions of the Canadian Diabetes Association are explained. Patients are told where they may purchase supplies. Information sources are highlighted, and the individuals are also told they can contact the personnel if they require further advice or assistance.

A modified form of the mastery model of learning is utilized in both programs. Objectives, in terms of patient outcomes, and minimum acceptable standards for knowledge and skills have been established. Patients are initially assessed to determine their knowledge about diabetes. Problems which might interfere with learning are also identified. A variety of instructional methods including lecture, demonstration, and active participation in activities are utilized. The progress of the individual is assessed to determine how well he or she is meeting the goals. Based on the results of the assessment, measures are implemented to assist the individual. For example, a diabetic having difficulty in giving injections may be given supplementary instruction and practice. If an individual is having difficulty in learning the information, he or she may be encouraged to attend all or part of the program for a second time. Prior to completing the education program, each individual is assessed to determine how well he or she has met the objectives. If there is a concern about how well a person will manage at home, various options may be considered. A referral may be made to the Home Care Nurse or Victorian Order of Nurses so that the individual will be seen in his home. An individual may also be referred to his personal physician for further counselling. In both programs, diabetic individuals are encouraged to be as self-sufficient as possible, and to reach the point where they can assume the responsibility for caring for themselves.

The nature and structure of the two programs results in differences between them. The program at the metabolic centre is designed to provide both education and clinical management for diabetic individuals. The staff consists of two physicians, a nurse, a dietitian, and other support staff who adopt a team approach to the education and management of diabetes. The program is four full days in length, so the opportunity is available to present a large amount of information. The time and facilities are available to permit supervised, repeated, active participation of subjects in such areas as medication administration, urine testing, blood glucose determinations, meal planning and food selection. Individual counselling is provided by the various staff on a daily basis.

The hospital program is not as cohesive and autonomous. The program is designed to provide information. Clinical management is the responsibility of each patient's physician. The hospital employs one diabetes nurse educator, who is responsible for patients in the entire complex. She conducts three of the four one and one-half hour lectures that make up the program. The other lecture is presented by a dietitian. Time constraints do not allow the same amount of information to be presented. The facilities are not presently available to allow for the same degree of active participation in such areas as meal planning and selection. The diabetes nurse educator must allocate her time among the patients on the basis of priority needs. As a consequence, the information presented in class must be reinforced and supplemented by the unit staff. However, by means of communication and consultation among the various personnel involved in the patient's care (the nurse educator, the unit staff, the dietary staff and the physician) as well as effective use of the patient's chart and the teaching checklist, the means are available to provide instruction to patients based on their individual needs.

The reactions of the subjects to the education experience suggest that the education programs provide more than just knowledge and skills. All of the subjects felt the programs were very helpful in teaching them what diabetes is and what care is required. Several subjects mentioned that the staff helped to allay their fears and provide them with confidence that they would be able to manage to care for themselves at home. Some subjects recognized that they were provided with the motivation to follow their regimens when they returned home.

Few of the subjects had suggestions for changes; however, one suggestion that was made by subjects in both programs was the need for more information concerning the emotional aspects of being diabetic and the adjustments involved. Subjects also commented on the amount of material presented. They felt that there was too much material to absorb. One subject suggested longer breaks. Another subject expressed the opinion that individuals should be allowed time to adjust to the fact they are diabetic before being faced with the large amount of material to be learned.

Question 2. What knowledge and performance levels regarding the prescribed therapeutic regimen are demonstrated by patients immediately upon completion of the education program?

The results of the pretest and posttest demonstrate that the knowledge levels of subjects increased by the completion of the education program. Subjects were able to correctly answer the majority of questions in all categories. Difficulty was encountered in answering comprehensive questions, particularly those concerning interrelationships among aspects of control. None of the subjects were able to answer completely correctly the questions requiring them to identify and differentiate between the symptoms of hyperglycemia and hypoglycemia.

All of the subjects had mastered the selected skills which were assessed. All were able to either demonstrate or outline the proper procedure for footcare. The insulin dependent diabetics, with one exception, were able to draw up and administer their insulins following the correct procedure. The wife and daughter of the subject who refused were able to perform this procedure competently. Uncertainty was evident among some subjects. Blurred vision and difficulty seeing the markings on the syringe presented problems for two of the subjects. The two subjects taking oral hypoglycemic medications were able to measure and administer the medications correctly. They were also able to relate the appropriate information concerning characteristics of the medication.

Question 3. What knowledge and performance levels regarding the prescribed therapeutic regimen are demonstrated by patients six weeks after completion of the education program?

The results of the follow-up test of knowledge revealed changes in the knowledge levels of many of the subjects. Compared to the posttest results, the scores of five subjects increased, three decreased and two remained the same. While the comprehensive questions continued to present more difficulty than the simple knowledge questions, some subjects showed an increase in their ability to correctly answer them. Four subjects were able to more clearly identify and differentiate the symptoms of hyperglycemia and hypoglycemia. The four subjects were insulin-dependent and all had experienced insulin reactions. However, one subject, who had experienced at least two severe reactions, was still unable to correctly answer the questions. The two subjects on oral hypoglycemics increased their scores on the diet questions. There was not a consistent pattern between compliance with a specific aspect of the regimen and increased knowledge, nor was there a consistent pattern between lack of compliance and decreased knowledge. No other significant response patterns were identified.

Some changes were observed in the subjects' abilities to accurately perform the selected skills. Three of the six insulin-dependent subjects demonstrated decreased accuracy in preparing and administering insulin, while two subjects, and the wife of the third, demonstrated increased confidence.

The two subjects taking oral hypoglycemic medications, while able to prepare and administer the correct dose, were unable to accurately recall the peak time of action of the medications. These subjects show decreased accuracy in their ability to test their urines and two subjects had forgotten part of the footcare procedure.

The extent of compliance with the therapeutic regimen varied widely among the subjects. Only two subjects completely complied with all aspects. One subject partially complied with only two aspects of her regimen. The remaining subjects ranged between these two extremes in the extent to which they complied with their regimens.

The greatest degree of compliance was found with medications. The two subjects taking oral hypoglycemic medications and four of the six insulin dependent diabetics completely complied in this area. The remaining two insulin-dependent subjects partially complied in that they did not perform the procedure themsleves but had their wives do it for them. All of the subjects believed in the importance of the medications in maintaining their continued good health.

Urine testing was the next area of greatest compliance. All subjects either completely or partially complied. Inconvenience was the most common reason given for failure to test the urines as frequently as prescribed. One subject expressed a lack of belief in the value of performing this procedure when the results were constantly negative.

Footcare was another aspect of the regimen with which all of the subjects either completely or partially complied. The subjects all expressed a belief in the importance of caring for the feet and were aware of the dangers associated with cuts or infections. Again, inconvenience was the most common reason for failure to completely comply with this treatment. Two subjects, although aware of the reasons for not going barefoot, continued to do so.

Diet and exercise were the aspects of the regimen with which subjects complied least. Difficulty in following the diet, particularly when eating out, was the most common reason given for failure to comply. One subject wanted to lose weight so she occasionally skipped meals and snacks. Another subject stated she didn't know enough about the diet to follow it at home.

A lack of belief in the value of exercise in improving health appears to be the main reason that several of the subjects do not comply, or only partially comply with this aspect of the regimen. The subjects who completely comply are convinced of the benefits of regular exercise.

There is a disparity among some subjects between how well they think they are complying with their regimens and how well they actually are complying. Some subjects who only partially comply or do not comply with different treatments believe they are following the physician's directions well.

Lack of knowledge is not the major reason why subjects fail to comply or only partially comply. Lack of knowledge was given as a reason by only one subject to explain why she did not follow a diabetic diet. Rather, it appears that a lack of belief in the value of a treatment, or the cost of complying, in terms of convenience or change in lifestyle, are the major reasons that subjects do not completely comply with their prescribed therapeutic regimens.

Question 4. What problems do patients encounter in following their prescribed therapeutic regimens during the six weeks after completion of the education program?

The most common problem identified was difficulty in following the diet. Lack of will-power when shoppping out was a frequent concern. The actions of other people were also seen as a problem by some subjects. They explained that people do not understand the need for controlled food intake; they make eating out uncomfortable by eating foods diabetics can't eat, or urging them to eat foods they shouldn't have. Three subjects stated that, at first, they found it hard to remember to eat their meals and snacks on time, but had since established a regular routine.

As previously mentioned, one subject, who had not received individual diet counselling or a diet prescription, identified lack of knowledge as the major problem.

Three subjects had problems with insulin injections. Two subjects had blurred vision initially and found it difficult to draw up the correct dose. One subject was very resistant to injections and found them difficult to face every day. After a few weeks, he found that he could accept the injections if someone else gave them, but continued to refuse to inject himself.

One subject had a severe insulin reaction and, as she was nauseated, could not eat anything. Her husband phoned a hospital emergency department to get professional advice.

Psychological concerns were a problem for one subject who believed the illness had affected his sexuality. The subject also found that being diabetic was a handicap when applying for a job.

Most of the subjects found it necessary to make some adjustments in their routines. For example, some of the subjects on insulin found that it took longer to prepare and give the injection than they expected. Getting a routine established was a major adjustment for most subjects. However, they felt that once the routine was established, they did not encounter any difficulty.

The support of relatives was identified by most subjects as important in helping them to follow their routines. Relatives engaged in activities such as helping with injections, meal planning and preparation, and reminding subjects to eat and test their urines on time. They also provided support and encouragement in helping subjects to adjust to the changes in their lives. They were frequently consulted by subjects when problems arose.

II. CONCLUSIONS

While the findings may have some applicability to others who resemble the individuals in the sample, it would be unwise to generalize from this study of ten diabetic individuals. The results of the study may be of interest to individuals concerned with the problem of compliance and to those individuals interested in the education of diabetics. In terms of the subjects included in the sample group, the following conclusions are presented.

1. Subjects entering an education program vary widely in social and disease-related characteristics.

2. The patient education programs provide subjects with the knowledge and skills needed to carry out their prescribed treatment regimens.

3. Education programs are important to subjects in providing information about what diabetes is and the care it requires.

4. Knowledge of the disease and its treatments is not the primary determinant of compliance.

5. Belief in the value of a treatment and the effect of the treatment on a person's lifestyle are important factors in compliance.

6. Some individuals will adapt their lifestyles to accommodate the prescribed therapeutic regimen and others will adapt the prescribed therapeutic regimen to accomodate their lifestyles.

7. Some individuals display a disparity between how well they are actually doing and how well they think they are doing in following their prescribed therapeutic regimens.

8. The support of family members, or significant others, is important in promoting an individual's compliance with a prescribed therapeutic regimen.

III. IMPLICATIONS

1. To accommodate the diversity among individuals attending diabetes education programs, flexibilty of content and instructional methods are required to taylor education to individual needs.

2. The difficulties subjects experienced in answering questions about interrelationships among aspects of control and questions about complications suggest that this is an area that requires examination in terms of instruction content and methods.

3. The concern about the amount of material subjects are expected to learn indicates a need to examine the structure and amount of content of diabetes education programs.

4. Health care professionals must not assume that providing an individual with knowledge will ensure that he complies with the prescribed treatments. Psychosocial factors must be examined for each individual.

5. Strategies to improve compliance must include behavioural, as well as educational, strategies if they are to be successful.

6. The variations in knowledge, skills and compliance demonstrated by subjects six to thirteen weeks following completion of an education program, as well as subjects reactions to the follow-up interview, suggest that there is a need for individuals to have regular reassessments and reviews.

7. The supportive impact of relatives, as well as their ability to learn the material presented, suggests that health care professionals should examine ways to increase family involvement in education and ways to maximize family support for the individual.

IV. SUGGESTIONS FOR FURTHER RESEARCH

The findings of this study suggest several avenues for further research.

1. A replicate study is needed to provide information about the reliability of the research instruments.

2. A large-scale study of the relationship between knowledge and compliance in diabetes is needed to provide a broader base of information.

3. A longitudinal study is needed to determine whether compliance behaviours change over time, and if so, in what direction.

4. Further research is needed into the relationships between psycho-social factors and compliance with diabetics.

5. A study comparing the effectiveness of different types of diabetes education programs would provide useful information for future planning.

6. A study of the relationship between lifestyle and compliance in diabetes would provide valuable information in planning strategies to improve compliance.

7. A comparison study of motivations to comply and compliance behaviours might provide useful information for diabetes educators.

8. An investigation is needed to compare the extent of compliance in diabetic individuals with different treatment modalities (diet, diet and oral hypoglycemics, diet and insulin).

9. The extent to which subjects learn from their disease is an area of investigation which will provide useful information.

10. Further investigation is needed regarding the effectiveness of various aspects of the therapeutic regimen on diabetic control.

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APPENDIX A

Information Sheet

Consent Form

INFORMATION SHEET

June 1981

Project: A STUDY OF PATIENT EDUCATION AND DIABETES MELLITUS

Investigator: ALICE DELANY
DEPARTMENT OF EDUCATIONAL ADMINNISTRATION
UNIVERSITY OF ALBERTA
EDMONTON, ALBERTA
PHONE - 432 - 4913

When a person is diagnosed as having Diabetes Mellitus, the doctor prescribes treatments and certain routines to be carried out at home. The purpose of this study is to examine the learning that occurs with the person with diabetes, and how he or she fits the doctor's recommendations into daily life. It is hoped that this study will gain information which can be used to help others in similar circumstances. You are being asked to participate in this study and to sign the attached consent form.

To obtain the desired information, the investigator needs to test your knowledge at specific intervals, observe you perform certain routines, and to interview you at your home approximately six weeks after classes are completed.

Each interview is confidential and anonymity is guaranteed. The interview in your home would be arranged at a time of mutual convenience to you and the investigator.

CONSENT FORM

Project: STUDY OF PATIENT EDUCATION AND DIABETES MELLITUS

Investigator:
ALICE DELANY
DEPARTMENT OF EDUCATIONAL ADMINISTRATION
UNIVERSITY OF ALBERTA
EDMONTON, ALBERTA
PHONE -- 432-4913

I hereby consent to participate in the study of patient education and Diabetes Mellitus. I understand that my participation in this study involves completing tests of knowledge, being observed performing certain treatments, and being interviewed in my home on one occasion.

I understand that whatever information I give is considered confidential and will be used in such a way as to protect my anonymity.

Date ____________________

____________________ Principal Subject

____________________ Witness

APPENDIX B

Outline of Hospital Teaching Program

Hospital Teaching Checklist

DIABETES MELLITUS TEACHING PROGRAM - HOSPITAL

MONDAY-DIABETES MELLITUS

1. Film Strips and Tape - "What is Diabetes?"

2. Talk re:
   - History of Diabetes
   - Who becomes Diabetic
   - Hyperglycemia - list symptoms
   - Diagnosis and treatment choices

3. Necessity of good control: Complications
   - Retinopathy
   - Neuropathy
   - Nephropathy
   - Coronary Artery Disease

4. What of the Future?
   - Artificial Pancreas
   - Pancreatic Transplant
   - Surgical Genetics
   - Bacterial Insulin

5. Emotional Aspect - give opportunity to voice how it feels to be diagnosed as a Diabetic

6. Demonstrate use of Keto Diastix - instruct patients to learn to do own urine testing.

7. Distribute kit to each patient - Stress:
   - Canadian Diabetic Association
   - Wallet Identification Card
   - Medic Alert Bracelet
   - Dietary Assistance
     i) Dial-a-Dietitian
     ii) Olive Gerrard
     iii) Dietary Department

8. Show Patients
   - "Diabetes - A Manual for Canadians"
   - Cookbook for Diabetics

9. Alberta Aids to Daily Living

DIABETES MELLITUS TEACHING PROGRAM

TUESDAY-DIET-DIETITIAN FROM DIETARY

1. Film Strips and Tape - "Diet and Diabetes"
2. Discussion of Exchange Lists.
3. Example of Menu Planning utilizing Exchange Lists - Demonstration of types of food to buy.
4. Days of Illness - Liquid Diet.
5. Exercise.

DIABETES MELLITUS TEACHING PROGRAM

WEDNESDAY-INSULIN

1. Film Strips and Tape - "Insulin and Insulin Injection Technique".
2. Demonstration of available syringes and self helps.
3. Discussion of types of Insulin and Action of each.
4. Discussion of Hypoglycemia (Insulin Reaction) - Treatment-Cause
   - Demonstrate-Glutose
5. Care of Insulin and Equipment.
   Buying of Insulin - Expiration Date.
   Storing of Insulin.
6. Travelling with Insulin.
7. Insulin adjustment - activity.
8. Days of Illness.
9. Chemstrip - B.G.

DIABETES MELLITUS TEACHING PROGRAM

THURSDAY-URINE TESTING AND HEALTH TEACHING

1. Film Strips and Tape - "Urine Testing".
2. Demonstrate use of - Test Tape
   - Keto Diastix
   - Clinitest - 5 drop and 2 drop method
   - Acetest

   Note: - expiration date on bottle.
   - the need to talk in terms of percentage.
3. Insulin adjustment - in reference to urine test and activity.
4. Hyperglycemia and Hypoglycemia as they effect and show up in the urine test.
5. Days of illness.
6. Chemistrip B.G.
7. Review procedure for "Care of the Feet" - Skin Care
   - Dental Care
   - Eye Care

DIABETIC TEACHING CHECKLIST

	DATE	Describe Patients Response/Signature
I. **General Information:** A. "Donny has Diabetes" and/or "Juvenile Diabetes Mellitus" read with child and/or parent. "Diabetes, A Manual for Canadians"		
B. Given: i) I.D. card		
ii) Application form for C.D.A. and Medic-Alert		
C. Has viewed film "Edi"		
D. Attended Diabetes Teaching Classes: i) What is Diabetes ii) Diet iii) Insulin iv) Urine testing and Health Teaching		
II. **Teaching about Insulin:** A. Types and Actions of Insulin		
B. Care of equipment		
C. Drawing up Insulin & nurse giving injection i) Instruction while observing nurse		
ii) Demonstration by patient and/or relative a) Drawing up of water and giving injection		
b) Giving water injection to nurse (if applicable)		
c) Mixing two types of insulin		
d) Giving q a.m. insulin		
e) Rotation of injection sites		
f) Another family member able to prepare and give insulin		

	DATE	REMARKS AND SIGNATURE
III. Teaching about Oral agent:		
A. Name of oral Hypoglycemic		
B. Action of oral Hypoglycemic		
IV. Teaching about Urine Testing:		
A. Given a record book and record started of daily urine tests		
B. Explanation of testing and why		
C. Double voiding if Insulin dependent		
D. Single voiding 2 hrs. pc meals if Diet and/or oral agent control		
E. Testing equipment available		
F. Demonstration by patient and/or relative of correct method of urine testing and correct timing.		
V. Teaching about Hygiene:		
A. Foot care		
B. Eye examination		
C. Dental care		
D. Exercise		
E. Effects of illness		
VI. Teaching about Reactions:		
A. Hypoglycemia i) Symptoms and reasons		
ii) Treatment		
iii) Induced reaction		
iv) Recording reactions		

	DATE	REMARKS AND SIGNATURE
B. Hyperglycemia i) Symptoms and reasons		
ii) Treatment		
VII. Discussion about Canadian Diabetic Association: i) Equipment available		
ii) Meetings (a) mothers' group (b) monthly (c) Diabetic camp for children		
iii) School referral sheet given		
iv) C.D.A. information envelope given		
v) Cookbook for Diabetics		
VIII. Teaching by Dietition: A. Meal planning		
B. Practice meal planning		
C. Liquid diet		
D. Instruction to parent and/or relative		
IX. Discharge Planning: A. Signs and symptoms of reactions to be discussed with: Friends Teachers Co-workers		
B. Written instruction given for: - equipment		
- Prescription - Insulin - oral hypoglycemic agent		
- insulin type and dose		

	DATE	REMARKS AND SIGNATURE
- diet		
- urine testing		
- days of illness		
- rotation sites for insulin		
- foot care		
- review quiz (Children's Pavilion)		

** Nurses Summary

APPENDIX C

Outline of Metabolic Centre Teaching Program

DIABETES MELLITUS TEACHING PROGRAM

METABOLIC CENTRE

MONDAY

0700 - 0800h.	Registration Height and Weight taken Blood Glucose Urine Testing Diet History and Meal Planning
0800 - 0830h.	Insulin orders and injections Breakfast Individual teaching
0830 - 1000h.	Diet as treatment Introduction of meal planning and six food groups Basic meal plan adjustment
1000 - 1030h.	Blood glucose and urine tests Snack Select meals and snacks for following day
1030 - 1100h.	What is Diabetes Mellitus? Stresses Diagnostic tests Books to buy and read
1100h.	Blood glucose and urine tests
1100 - 1200h.	Symptoms of Diabetes Mellitus First day quiz Give out sugar cubes
1200 - 1300h.	Lunch Weighing and measuring of food Exercise
1300 - 1400h.	Urine testing methods Correct recording in daily diary
1400 - 1500h.	Doctor's visits Blood glucose @ 1400 & 1500h. Urine tests @ 1400h. Individual teaching
1500h.	Snack

TUESDAY

0700	0800h.	Weight Dextrostix Daily diary
0800	0830h.	Insulin orders and injections Breakfast Weighing and measuring of food Individual teaching
0830	1000h.	Detailed review of meal planning booklet Commercial food lists Recipes - Importance and source
1000	1030h.	Urine tests Snack Select meals and snack for the following day
1030	1100h.	Hypoglycemia - causes - signs - symptoms
1100h.		Urine tests
1100	1200h.	Reactose Glucagon Teaching of and return demonstration of dextrostix by patient
1200	1300h.	Lunch Weighing and measuring of food Exercise
1300	1400h.	Calorie free, calorie poor and diabetic foods Label reading Weight reduction Behaviour modification Advanced meal plan assignment
1400	1500h.	Doctor's visits Urine tests @ 1400h. Dextrostix - individual teaching
1500h.		Snack

WEDNESDAY

0700 - 0800h.	Weight Blood glucose Urine tests Daily diary Follow-up - patients meal plan review
0800 - 0830h.	Insulin orders and injections Breakfast Weighing and measuring of food Indiviual teaching
0830 - 1000h.	Canadian Diabetic Association and American Diabetic Association Journals. Exercise and dietary requirements Delayed meals Fluid diet for days
1000 - 1030h.	Blood glucose and urine tests Snack Select meals and snack for the following day
1030 - 1100h.	Insulin types, storage, etc. Oral hypoglycemic agents
1100h.	Blood glucose and urine tests
1100 - 1200h.	Acidosis and rules for adjusting insulin dose
1200 - 1300h.	Lunch Weighing and measuring of food Exercise
1300 - 1400h.	Evaluation of knowledge for adjusting insulin at home
1400 - 1500h.	Doctor's visits Blood glucose tests @ 1400h. and 1500h. Urine tests @ 1400h. Revisions of meal plans
1500h.	Snack

THURSDAY

0700 - 0800h.	Weight Dextrostix Urine tests and daily diary Meal plan revisions for home
0800 - 0830h.	Insulin orders and injections Breakfast Weighing and measuring of food
0830 - 1000h.	Follow-up program Eating out Travelling guidlines Wise use of alcohol Meal planning quiz
1030 1100h.	Foot care Complications
1100h.	Urine tests
1100 - 1200h.	Travelling I.D. Card Canadian Diabetic Association Membership
1200 - 1300h.	Lunch Weighing and measuring of food Examination of feet
1300 - 1400h.	Last day quiz Examination of feet
1400 - 1500h.	Doctor's visits Urine tests @ 1400h. Dextrostix
1500h.	Snack

APPENDIX D

Diabetes Knowledge Pretest

DIABETES KNOWLEDGE PRETEST NAME:

PATIENT QUESTIONNAIRE FOR DIABETES

The purpose of this questionnaire is to determine your present level of knowledge about diabetes. Please try to answer all of the questions. If you do not know the answer to a question pleasae do NOT guess.

PART A

This section consists of two questions which require a written answer.

QUESTION ONE: In your own words, describe what the term "diabetes" means to you.

QUESTION TWO: a) Have you ever known any people who have diabetes?

b) What relationship did they have to you - friend?
- relative?
- co-worker?

c) What did you learn about diabetes from them?

PART B

This section consists of 20 TRUE-FALSE questions. Please mark an "X" in the blank next to the appropriate answer. If you do not know the answer, or are uncertain, put an "X" in the blank next to the phrase -- "Don't know".

1. Diabetes is an illness than can be cured.

___ True
___ False
___ Don't know

2. Lack of insulin is a major cause of diabetes.

___ True
___ False
___ Don't know

3. It is important that a person with diabetes always carry identification stating that he is diabetic.

___ True
___ False
___ Don't know

4. The circulation of the blood in the feet is usually better in people with diabetes than in other people.

   ___ True

   ___ False

   ___ Don't know

5. It is very important that diabetics have regular dental and eye examinations.

   ___ True

   ___ False

   ___ Don't know

6. A diabetic can eat foods which contain sugar in controlled (measured) amounts.

   ___ True

   ___ False

   ___ Don't know

7. The only time a diabetic should eat food with a lot of sugar (such as lifesavers) is when he is having an insulin reaction.

   ___ True

   ___ False

   ___ Don't know

8. A diabetic's weight does NOT affect the amount of diet and medications he requires.

   ___ True

   ___ False

   ___ Don't know

9. A diabetic who takes daily insulin should always have a snack before bedtime.

___ True

___ False

___ Don't know

10. Exercise helps to use up sugar in the body.

___ True

___ False

___ Don't know

11. In the human body, insulin is produced by the liver.

___ True

___ False

___ Don't know

12. Insulin in pill form can be used to control diabetes in some people.

___ True

___ False

___ Don't know

13. Sites for insulin injection should be rotated daily,.

___ True

___ False

___ Don't know

14. If a person who takes insulin daily develops a fever, he will probably need less insulin than usual.

___ True
___ False
___ Don't know

15. When a diabetic takes medication (insulin or pills), if he increases his physical activity he should also increase his food intake.

___ True
___ False
___ Don't know

16. If a diabetic has cold feet, he should use a heating pad to warm them.

___ True
___ False
___ Don't know

17. Iodine should be applied immediately to any cuts on the feet of a diabetic.

___ True
___ False
___ Don't know

18. A diabetic's toenails should be cut straight across.

___ True
___ False
___ Don't know

19. Diabetics should keep a written record of daily urine tests.

___ True

___ False

___ Don't know

20. Ketones are NOT normally found in a diabetic person's urine.

___ True

___ False

___ Don't know

APPENDIX E

Diabetes Knowledge Posttest

Diabetes Knowledge Follow-up Posttest

DIABETES KNOWLEDGE POSTTEST NAME:

TEST OF KNOWLEDGE ABOUT DIABETES

The purpose of this test is to determine your present level of knowledge about diabetes. Please try to answer all of the questions. If you do not know the answer to a question, please do NOT guess.

PART A

This section consists of 20 TRUE-FALSE questions. Please make an "X" in the blank next to each appropriate answer. If you don't know the answer, or are uncertain, put an "X" in the blank next to the phrase -- "Don't know".

1. Diabetes is an illness than can be controlled but not cured.

___ True
___ False
___ Don't know

2. A lack of sugar in the blood is a major cause of diabetes.

___ True
___ False
___ Don't know

3. A diabetic should always carry identification stating that he has diabetes.

   ___ True

   ___ False

   ___ Don't know

4. The circulation of the blood in the feet is usually not as good in diabetics as in other people.

   ___ True

   ___ False

   ___ Don't know

5. Diabetes may have some effect on a person's vision.

   ___ True

   ___ False

   ___ Don't know

6. A diabetic should eat a diet containing measured amounts of carbohydrates.

   ___ True

   ___ False

   ___ Don't know

7. A person with diabetes should NEVER eat any concentrated forms of sugar.

   ___ True

   ___ False

   ___ Don't know

8. A diabetic person's weight affects the amount of diet and medication he requires.

___ True

___ False

___ Don't know

9. A diabetic should eat only three meals a day.

___ True

___ False

___ Don't know

10. Exercise helps to increase the level of blood sugar in the body.

___ True

___ False

___ Don't know

11. In the human body, insulin is produced in the pancreas.

___ True

___ False

___ Don't know

12. Insulin can be given only by injection.

___ True

___ False

___ Don't know

13. Sites for insulin injection should be rotated once a week.

    ___ True

    ___ False

    ___ Don't know

14. If a person who takes insulin daily develops an infection, he will probably need more insulin than usual.

    ___ True

    ___ False

    ___ Don't know

15. When a diabetic increases his physical activity, he should also increase the amount of his daily insulin or pills.

    ___ True

    ___ False

    ___ Don't know

16. A diabetic should test his urine every day to check for the presence of glucose.

    ___ True

    ___ [✓ False]

    ___ Don't know

17. If a diabetic has cold feet, he should NOT use a heating pad to warm them.

    ___ True

    ___ False

    ___ Don't know

18. Diabetics should NOT apply strong solutions such as iodine to their feet.

___ True

___ False

___ Don't know

19. When a diabetic cuts his toenails, he should round them at the corners.

___ True

___ False

___ Don't know

20. Ketones are normally found in the urine of a person whose diabetes is under control.

___ True

___ False

___ Don't know

PART B

This section consists of 13 MULTIPLE-CHOICE questions. Some questions have more than one right answer. The number of right answers is shown in brackets to the right of each question. Put an "X" in the blank beside each correct answer. Please do NOT guess. If you do not know the answer leave the question blank.

1. Diabetes is a condition in which the body does not have enough

   ___a) sugar (1 ANSWER)
   ___b) insulin
   ___c) iron
   ___d) oxygen

2. Common signs which a new diabetic may display include

   ___a) drinking more fluids than normal (3 ANSWERS)
   ___b) going to the bathroom more often.
   ___c) coughing frequently.
   ___d) gaining weight.

3 Which kinds of people would be most likely to get diabetes.

   ___a) People who are overweight. (2 ANSWERS)
   ___b) People who are underweight.
   ___c) People who are athletes.
   ___d) People who have relatives with diabetes.
   ___e) People who are young.

4. Which statements BEST describe what happens in hyperglycemia (acidosis or diabetic coma)? (3 ANSWERS)

   ___a) It comes on slowly (1-2 days).

   ___b) There is too much sugar in the blood.

   ___c) The person feels shaky, sweaty and hungry.

   ___d) The person drinks more and goes to the bathroom often.

5. Common signs of an insulin reaction (shock or hypoglycemia) include.

   ___a) increased thirst, flushed dry skin. (2 ANSWERS)

   ___b) increased hunger, pale skin.

   ___c) vomiting, fruity breath.

   ___d) blurred vision, sweating.

6. When a diabetic feels than an insulin reaction is starting, the FIRST thing he should do is.

   ___a) take something sweet. (1 ANSWER)

   ___b) call the doctor.

   ___c) test his urine.

   ___d) go to the hospital.

7. Which statements about diabetic diets are TRUE?

   ___a) Foods should be either measured or weighed. (2 ANSWERS)

   ___b) Foods from one exchange (or choice) list can be substituted with foods from another exchange (or choice) list.

   ___c) Glucose is the only kind of sugar that must be limited.

   ___d) Special "diet" foods have a caloric value and should be calculated into the diet.

8. Which of the following can a diabetic have freely without calculating into his diet.

___a) Alcohol. (2 ANSWERS)

___b) Tea.

___c) Skim milk.

___d) Clear soup.

9. For supper one evening a diabetic person is given one exchange of fish which he does not eat. In place of fish he may have.

___a) 1/4 cup of apple juice. (1 ANSWER)

___b) a fresh tomato.

___c) 1 cup of cottage cheese.

___d) one weiner.

10. A diabetic taking daily injections of an intermediate-acting insulin such as N.P.H. will MOST LIKELY develop an insulin reaction during

___a) early morning. (1 ANSWER)

___b) mid morning.

___c) mid afternoon.

___d) late evening.

11. What effect does increased exercise have on a person's blood sugar?

___a) It makes it go up. (1 ANSWER)

___b) It makes it go down.

___c) There is no effect.

12. A diabetic who takes daily insulin wakes up one morning to find he has the "flu" and is not hungry. The BEST procedure for him to follow is to

___a) change his food to fluid exchanges. (1 ANSWER)
and take the same amount of insulin.

___b) eat as much of his normal diet as he is able
to and reduce the amount of insulin.

___c) eliminate his meat and vegetable exchanges
but increase the amount of fruit juices.

___d) increase the amount of insulin and call
the doctor.

13. Which statement BEST describe good health practices for diabetics? They should

___a) avoid any unnecessary physical activity. (2 ANSWERS)

___b) eat all of their meals in their own home.

___c) take good care of their skin.

___d) make sure they get sufficient rest
and sleep.

DIABETES KNOWLEDGE OF FOLLOW-UP POSTTEST NAME:

TEST OF KNOWLEDGE ABOUT DIABETES

The purpose of this test is to determine your present level of knowledge about diabetes. Please try to answer all of the questions. if you do not know the answer to a question, please do NOT guess.

PART A

This section consists of 20 TRUE/FALSE questions. Please mark an "X" in the square next to each appropriate answer. If you don't know the answer, or are uncertain, put an "X" in the blank next to the phrase --"Don't Know".

1. A lack of sugar in the blood is a major cause of diabetes.

   ☐ True
   ☐ False
   ☐ Don't know

2. Diabetes is an illness that can be controlled but not cured.

   ☐ True
   ☐ False
   ☐ Don't know

3. In the human body, insulin is produced in the pancreas.

☐ True

☐ False

☐ Don't know

4. Insulin can be given only by injection.

☐ True

☐ False

☐ Don't know

5. A diabetic person's weight affects the amount of diet and medication he requires.

☐ True

☐ False

☐ Don't know

6. A diabetic should eat a diet containing measured amounts of carbohydrates.

☐ True

☐ False

☐ Don't know

7. A diabetic should eat only three meals a day.

☐ True

☐ False

☐ Don't know

8. A person with diabetes should NEVER eat any concentrated forms of sugar.

   ☐ True

   ☐ False

   ☐ Don't know

9. Ketones are normally found in the urine of a person whose diabetes is under good control.

   ☐ True

   ☐ False

   ☐ Don't know

10. A diabetic should test his urine every day to check for the presence of glucose.

    ☐ True

    ☐ False

    ☐ Don't know

11. Sites for insulin injection should be rotated once a week.

    ☐ True

    ☐ False

    ☐ Don't know

12. If a person who takes insulin daily develops an infection, he will probably need more insulin than usual.

    ☐ True

    ☐ False

    ☐ Don't know

13. Exercise helps to increase the level of blood sugar in the body.

☐ True

☐ False

☐ Don't know

14. When a diabetic increases his physical activity, he should also increase the amount of his daily insulin or pills.

☐ True

☐ False

☐ Don't know

15. The circulation of the blood in the feet is usually not as good in diabetics as in other people.

☐ True

☐ False

☐ Don't know

16. When a diabetic cuts his toenails, he should round them at the corners.

☐ True

☐ False

☐ Don't know

17. Diabetics should NOT apply strong solutions such as iodine to their feet.

☐ True

☐ False

☐ Don't know

18. If a diabetic has cold feet, he should NOT use a heating pad to warm them.

☐ True

☐ False

☐ Don't know

19. Diabetes may have some effect on a person's vision.

☐ True

☐ False

☐ Don't know

20. A diabetic should always carry identification stating that he has diabetes.

☐ True

☐ False

☐ Don't know

PART B

This section consists of 13 MULTIPLE CHOICE questions. Some questions have more than one right answer. The number of right answers is shown in brackets to the right of each question. Put an "X" in the square beside each correct answer. Please do NOT guess. If you do not know the answer leave the question blank.

1 Which kinds of people would be most likely to get diabetes.

- ☐ a) People who are overweight. (2 ANSWERS)
- ☐ b) People who are underweight.
- ☐ c) People who are athletes.
- ☐ d) People who have relatives with diabetes.
- ☐ e) People who are young.

2. Common signs which a new diabetic may display include

- ☐ a) drinking more fluids than normal. (3 ANSWERS)
- ☐ b) going to the bathroom more often.
- ☐ c) coughing frequently.
- ☐ d) gaining weight.

3. Diabetes is a condition in which the body does not have enough

- ☐ a) sugar. (1 ANSWER)
- ☐ b) insulin.
- ☐ c) iron.

4. Common signs of an insulin reaction (shock or hypoglycemia) include

☐ a) increased thirst, flushed dry skin. (2 ANSWERS)

☐ b) increased hunger, pale skin.

☐ c) vomiting, fruity breath.

☐ d) blurred vision, sweating.

5. A diabetic taking daily injections of an intermediate-acting insulin such as N.P.H. will MOST LIKELY develop an insulin reaction during

☐ a) early morning. (1 ANSWER)

☐ b) mid morning.

☐ c) mid afternoon.

☐ d) late evening.

6. When a diabetic feels than an insulin reaction is starting, the FIRST thing he should do is.

☐ a) take something sweet. (1 ANSWER)

☐ b) call the doctor.

☐ c) test his urine.

☐ d) go to the hospital.

7. Which statements BEST describe what happens in hyperglycemia (acidosis or diabetic coma)?

☐ a) It comes on slowly (1-2 days). (3 ANSWERS)

☐ b) There is too much sugar in the blood.

☐ c) The person feels shaky, sweaty and hungry.

☐ d) The person drinks more and goes to the bathroom often.

8. Which effect does increased exercise have on a person's blood sugar

☐ a) It makes it go up. (1 ANSWER)

☐ b) It makes it go down.

☐ c) There is no effect.

9. Which statements BEST describe good health practices for diabetics? They should.

☐ a) avoid any unnecessary physical activity. (2 ANSWERS)

☐ b) eat all of their meals in their own home.

☐ c) take good care of their skin.

☐ d) make sure they get sufficient rest and sleep.

10. Which statements about diabetic diets are TRUE?

☐ a) Foods should be either measured or weighed. (2 ANSWERS)

☐ b) Foods from one choice (or exchange list can be substituted with foods from another choice (or exchange) list.

☐ c) Glucose is the only kind of sugar that must be limited.

☐ d) Special "diet" foods have caloric value and should be calculated into the diet.

11. For supper one evening a diabetic person is given one exchange of fish which he does not eat. In place of fish he may have.

☐ a) 1/4 cup of apple juice. (1 ANSWER)

☐ b) a fresh tomato.

☐ c) 1 cup of cottage cheese.

☐ d) one weiner.

12. A diabetic who takes daily insulin wakes up one morning to find he has the "flu" and is not hungry. The BEST procedure for him to follow is to

(1 ANSWER)

☐ a) change his food to fluid exchanges and take the same amount of insulin.

☐ b) eat as much of his normal diet as he is able to and reduce the amount of insulin.

☐ c) eliminate his meat and vegetable exchanges but increase the amount of fruit juices.

☐ d) increase the amount of insulin and call the doctor.

13. Which of the following can a diabetic have freely without calculating into his diet?

(2 ANSWERS)

☐ a) Alcohol.

☐ b) Tea.

☐ c) Skim milk.

☐ d) Clear soup.

APPENDIX F

Skills Performance Checklists

INSULIN ADMINISTRATION CHECKLIST

	YES	NO	COMMENTS
1. Collects all necessary equipment			
a) includes - needle syringe insulin disinfectant			
b) if insulin refrigerated, removes from refrigerator at least five minutes before injection,			
2. Maintains acceptable aseptic technique when assembling equipment.			
a) if pre-packaged equipment used			
- examines package for any tears.			
- opens package without contamination.			
3. Mixes insulin by rotating vial(s) between palms of hands (does NOT shake).			
4. Checks bottom of insulin vial(s) to ensure no sediment remains on the bottom.			
Drawing up one type of insulin			
1. Cleans top of vial with disinfectant.			
2. Draws air into syringe equal to prescribed dose of insulin.			
3. Injects air into vial.			
4. Inverts vial.			
5. Makes sure needle is in solution at all times.			
6. Pulls plunger back the prescribed number of units.			
7. If air bubbles are present, removes either by tapping the syringe or by pushing air/insulin back into vial.			
8. Does not contaminate the needle or plunger.			
9. Withdraws needle from vial after ensurinig correct amount of insulin has been drawn up.			
10. Ensures needle and syringe remain uncontaminated prior to injection.			
Drawing up two types of insulin			
1. Cleans tops of both bottles with disinfectant.			

	YES	NO	COMMENTS
2. Draws air into syringe equal to dose of longer-acting insulin.			
3. Injects air into vial of longer-acting insulin.			
4. Withdraws needle from vial without drawing up any insulin.			
5. Draws air into syringe equal to dose of shorter-acting insulin.			
6. Injects air into vial of shorter-acting insulin.			
7. Inverts bottle.			
8. Ensures needle is in solution.			
9. Pulls plunger back to prescribed number of units of shorter-acting insulin.			
10. If air bubbles are present, removes either by tapping the syringe or by pushing the air/insulin back into the vial.			
11. Withdraws needle from vial after ensuring correct amount of shorter-acting insulin has been drawn up.			
12. Inverts bottle of longer-acting insulin.			
13. Inserts needle into vial of longer-acting insulin.			
14. Pulls plunger back to the total dosage of the mixture required.			
15. Does NOT allow shorter-acting insulin to be injected into vial of longer-acting insulin.			
16. If air bubbles present, removes by tapping the syringe. If unable to remove, starts procedure again.			
17. Withdraws needle from vial after ensuring correct amount of insulin has been drawn up.			
18. Ensures needle and syringe remains uncontaminated prior to injection.			
Drawing up three types of insulin			
1. Cleans tops of three bottles with disinfectant.			
2. Draws air into syringe equal to dose of longest-acting insulin.			
3. Injects air into vial of longest-acting insulin.			
4. Withdraws needle from vial without drawing up any insulin.			

	YES	NO	COMMENTS
5. Draws air into syringe equal to dose of intermediate-acting insulin.			
6. Injects air into vial of intermediate-acting insulin.			
7. Withdraws needle from vial without drawing up any insulin.			
8. Draws air into syringe equal to dose of shortest-acting insulin.			
9. Injects air into vial of shortest-acting insulin.			
10. Inverts bottle.			
11. Ensures needle is in solution.			
12. Pulls plunger back to prescribed number of units of shortest-acting insulin.			
13. If air bubbles are present, removes either by tapping the syringe or by pushing the air/insulin back into vial.			
14. Withdraws needle from vial after ensuring correct amount of shortest-acting insulin has been drawn up.			
15. Inverts bottle of intermediate-acting insulin.			
16. Inserts needle into vial of intermediate-acting insulin.			
17. Pulls plunger back the prescribed number of unnts for the intermediate-acting insulin.			
18. Does NOT allow shorter-acting insulin to be injected into vial of intermediate-acting insulin.			
19. If air bubbles present, removes by tapping the syringe. If unable to remove, starts procedure again.			
20. Inverts bottle of longest-acting insulin.			
21. Inserts needle into vial of longest-acting insulin.			
22. Pulls plunger back to the total dosage of the mixture required.			
23. Does NOT allow insulin in syringe to mix with insulin in vial.			
24. If air bubbles present, removes by tapping the syringe. If unable to remove, starts procedure again.			
25. Withdraws needle from vial after ensuring correct amount of insulin has been drawn up.			
26. Ensures needle and syringe remain uncontaminated prior to injection.			

	YES	NO	COMMENTS
Injecting the Insulin			
1. Selects site for injection.			
a) rotates site daily.			
b) inspects site for atrophy.			
c) palpates area to feel for any hardness.			
2. Cleans injection site with disinfectant using circular motion.			
3. Removes cap from syringe or picks up syringe without contaminating it.			
4. Holds syringe firmly.			
5. Pinches skin at injection site.			
6. Injects needle at a 90 degree angle into skin.			
7. Pulls plunger back slightly to check for blood.			
8. If no blood appears, pushes plunger in slowly to inject the insulin.			
9. Removes needle and applies disinfectant swab to injection site.			
10. Applies pressure to site of injection.			
11. Does NOT rub.			
12. Disposes of equipment appropriately.			

ORAL HYPOGLYCEMIC ADMINSTRATION CHECKLIST

	YES	NO	COMMENTS
1. Checks label for right medication.			
2. Identifies correct dose.			
3. Aware of action of medication.			
4. Identifies time of peak action of the medication.			
5. Takes medication at correct time.			
6. Maintains clean technique.			
7. Stores medication safely.			

URINE TESTING PROCEDURE

	YES	NO	COMMENTS
CLINITEST			
1. Assembles equipment.			
2. Checks to see if test tube and dropper are clean.			
3. Uses correct number of drops of urine (2) or (5).			
4. Uses correct number of drops of water (10).			
5. Holds dropper vertically.			
6. Allows drops to fall to bottom of tube rather than sliding down sides of tube.			
7. Drops one clinitest tablet into tube without touching tablet.			
8. Holds tube still rather than shaking while reaction takes place.			
9. Waits 15 seconds after boiling stops.			
10. Shakes container.			
11. Immediately reads results using appropriate chart.			
12. Rinses equipment.			
TESTAPE			
1. Tears strip off tape dispenser.			
2. Touches only end of tape NOT to be dipped into urine.			
3. Dips tape into urine.			
4. Removes tape from urine and reads results in exactly 60 seconds.			
5. Holds tape rather than putting it down until reading is made.			
6. Reads results correctly according to the appropriate chart.			
ACETEST			
1. Places acetest table on clean surface without touching it.			
2. Places one drop of urine on tablet.			
3. Waits exactly 30 seconds to read the results.			
4. Reads results correctly according to appropriate chart.			

	YES	NO	COMMENTS
KETODIASTIX			
1. Holds stick at proper end, not touching reactive paper.			
2. Dips stick into urine.			
3. Removes stick and waits exactly 15 seconds to read results for acetone.			
4. Holds stick horizontally so components will not run into one another.			
5. Reads results for acetone according to correct scale.			
6. Waits exactly 30 seconds from time of dipping stick into urine to read results for glucose.			
7. Reads results for glucose according to correct scale.			
8. Holds stick rather than putting it down until readings are complete.			

DIABETIC FOOTCARE PROCEDURE CHECKLIST

	YES	NO	COMMENTS
1. Examines feet daily.			
a) Looks at all surfaces and between toes.			
2. Cleans feet daily using a mild soap.			
a) Method One - cleans and soaks feet daily in bath or shower.			
b) Method two - soaks feet for 10 minutes and cleans in receptacle containing warm water.			
3. Always checks to make sure water is not too hot.			
4. Dries feet.			
5. Pushes back cuticles (if needed).			
6. Cleans toenails.			
7. Cuts and/or files toenails straight across.			
8. Applies lotion or alcohol.			
10. Applies fresh socks - no darns or seams.			
11. Does NOT walk with feet bare.			
12. Periodically feels insides of shoes for any rough edges.			

APPENDIX G

Interview Guide

INTERVIEW GUIDE

The following questions form the basis of a guide for interviews for each member of the patient group under study. The form and order of the questions may vary depending upon the circumstances at each interview, however, all of the topic areas will be covered.

GENERAL

How did you feel, both physically and emotionally, when you first learned that you had diabetes?

What made you go to see your doctor?

Have these things been corrected?

MEDICATION

What amount of medication are you taking now?

How frequently?

Has there been much change in dosage in the last six weeks?

At what time do you take your medication?

Describe how you rotate the sites for injection.

Have you been able to obtain the necessary equipment?

Have you experienced any difficulty in giving your insulin?

Did you experience any difficulty initially?

Have you noticed that there are things which make your insulin needs change?

Has the fact that you must give yourself a daily injection changed your normal routine?

REACTIONS AND OTHER ILLNESSES

Have you had any reactions?

When?

Do you have any warning signs?

What do you do to treat reactions?

Have you done anything different to prevent them?

Have you told your doctor?

What did he say to do?

What effect do your reactions have on the other members of your family?

How has your health been since you have been diabetic?

If you have been sick, how has it affected your diabetes?

DIET

What diet are you on right now?

Has this changed since you were first diagnosed as being diabetic?

Do you do your own meal planning? Cooking?

If not, who does?

How do you plan the meals?

Has this diet made a difference in food shopping? Costs? How?

How has this diet affected your normal meal schedule?

What happens on weekends?

What about when you eat out?

Why is diet so important in diabetes?

Have you experienced any major difficulties with the diet?

Is it difficult to stay with the diet?

Do you find that you sometimes don't follow the diet?

Under what circumstances?

Have you contacted the dietitian since you've been home?

Have you spoken to your doctor about your diet?

URINE TESTING

How often do you test your urines?

Is this what you were told to do in the classes/hospital?

Do you use a double-voided specimen? If not, why?

Do you record the results?

When you visit your doctor, do you show him the results?

Do you use the results of the urine tests to adjust your insulin?

If so, please explain how you do this?

Does the testing of urine creat any problems for you - e.g. at work or school?

If so, please explain.

FOOTCARE

Have you noticed any problems with your feet or skin?

How often do you do footcare?

Is this what you were told to do in the classes/hospital?

Why does extra care have to be taken with the skin and the feet?

What do you do about cuts, corns, callouses etc.?

Have you seen a foot doctor (podiatrist)?

EXERCISE

Has your level of activity changed at all since you've become diabetic?

What do you do for exercise? Before diagnosis? After?

What were you told to do about exercise when you were in the classes/hospital?

What did you doctor tell you to do?

How do you feel about the importance of exercise?

Have the directions about exercise created any problems or concerns for you? If so, in what way?

EFFECTS OF DISEASE

What major changes have you noticed in your life since you became diabetic?

What do you feel are the major problems with having this disease?

Has diabetes prevented you from doing things? If so, please explain.

Have you told your relatives/friends/co-workers?

How have they reacted?

Has being diabetic had much effect on members of your family? If so, what kinds of things have you noticed?

Do you do things that you know you probably shouldn't?

What kind of things? Why?

How did you learn about diabetes and what you have to do?

How much has your doctor told you about your disease?

How often have you seen him or spoken to him since coming home from the hospital or finishing classes?

What did you learn about diabetes from the nurses in the hospital?

From the dietitians?

Is there anything you can suggest that would be helpful for them to have done?

Which person would you say has been most helpful in assisting you to learn to care for your diabetes?

When you have questions or concerns about your diabetes, who do you contact?

Can you now identify any areas that you wish had been included as part of your education about diabetes? Please explain.

We discussed how you felt when you first found out you had diabetes. How do you feel about being diabetic now?